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Supporting the Internationalisation Strategy of Small Organisations

by

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A thesis submitted in partial fulfilment of the requirements for the
Degree of Doctor of Philosophy

Operational Research and Management Sciences Group
Warwick Business School
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This thesis is dedicated

to my wife

Francisca,

my little daughter

Magdalena

and

our baby who

is on the way

DECLARATIONS

- I am responsible for the work in this doctoral thesis.
 - This doctoral thesis has been written by me.
 - All verbatim extracts have been distinguished and the sources specifically acknowledged.
 - This doctoral thesis has not been submitted in any other university.
 - During the preparation of this doctoral thesis a number of papers and presentations were prepared as listed below. The remaining sections of the thesis are unpublished.
1. Supporting internationalisation strategies using System Dynamics modelling: Lessons from a strategic development approach, the OR54 Conference of the Operational Research Society, Edinburgh, United Kingdom, September 2012.
 2. Supporting the internationalisation strategy of a small firm, the 30th International Conference of the System Dynamics Society, St. Gallen, Switzerland, July 2012.
 3. Managing strategic thinking using resource maps (with Kunc M.), the YOR17 Conference, the Operational Research Society, Nottingham, United Kingdom, April 2011
 4. Managing strategic thinking in an international small organization using resource maps (with Kunc M.), the BALAS Conference, Santiago, Chile, April 2011.
 5. Managing strategic thinking in an international small and medium-sized organization (with Kunc M.), the Strategic Management Society Conference, Rio de Janeiro, Brazil, March 2011.

ABSTRACT

One of the main assumptions in the strategy field suggests that a manager's sequence of strategic decisions causes the evolution of resources and competitive positions to differ among firms over time. However, this evidence is not conclusive when Chief Executive Officers (CEOs) manage small firms which are located within markets with underdeveloped production of high-technology products and low technical knowledge required for production. This doctoral thesis concentrates on the investigation of how to support CEOs in their strategy development process related to an internationalisation strategy in small organisations –whose products and resources do not seem particularly unique – in giving them a competitive advantage over competitors in their target markets (e.g., fruit, wine, or fish industries). The present research has been conducted through two empirical investigations: an econometric analysis, and a case study research. The econometric analysis examines the role played by CEOs in the export intensity of commodity-based small firms. Results from this study revealed that the CEOs' education is particularly relevant for explaining the export intensity. CEOs who developed capabilities from formal training, in companies that do not seem endowed with particular idiosyncratic resources, export intensively. The case study followed a facilitated modelling approach based on System Dynamic (SD) Modelling. This second inquiry focused on structuring, simulating, and evaluating the potential consequences of the internationalisation strategy developed by five CEOs. Findings emerging from this process provide evidence that SD modelling allowed the CEOs to identify more resources and their interrelated relationships (e.g., links, feedback, and delay effects) compared with using a simple description of the internationalisation strategy. Additionally, simulations that have emerged from SD models provided CEOs with scenarios closer to reality for both assessing strategic ideas and learning from simulated performance.

ABBREVIATIONS

CEOs: Chief Executive Officers

DEA: Data Envelopment Analysis

GDP: Gross Domestic Product

IB: International Business

KIF: Knowledge Intensive Firms

MIT: Massachusetts Institute of Technology

MCDA: Multi-Criteria Decision Analysis

MNEs: Multinational Enterprises

OR/MS: Operational Research/Management Science

OLS: Ordinary Least Squares

PEST: Political, Economic, Social, and Technological

R&D: Research and Development

RQ: Research Question

RBV: Resource-based View

SMEs: Small and Medium-sized Enterprises

SDP: Strategic Development Process

SODA: Strategic Option Development and Analysis

SWOT: Strengths, Weaknesses, Opportunities, and Threats

SEM: Structural Equation Modelling

SD: System Dynamics

TCE: Transactional Cost Economic

VRI: Valuable, Rare, and Difficult to Imitate

VSM: Viable system model

WBS: Warwick Business School

Chapter 1

Introduction

1.1 Supporting the Internationalisation of SMEs

Strategic decision-making in organisations is affected by insufficient, unclear, or conflicting information over time. In such circumstances, the use of modelling and simulations can support managers of small firms in their reflective engagement and analytical reasoning processes. In recent years, several strategy research methods have been developed within the Operational Research/Management Science (OR/MS) field. This body of knowledge has focused specifically on how to support strategy processes through the articulation and evaluation of strategic issues at different organisational levels with the aim of creating a positive strategic impact on the organisation (Franco, O'Brien and Bell, 2011). This stream has emerged as a consequence of strategy process research that looked for new intervention techniques and tools which can be applied by strategists during decision-making (Hutzschenreuter and Kleindienst, 2006). Dyson (2004) refers to the process of supporting strategy using an OR/MS approach as the strategic development process. Traditionally, OR/MS methods have been used during the strategic development process to help individuals or groups to understand unstructured managerial decisions related to (O'Brien and

Dyson, 2007):

- setting direction (vision/mission)
- setting strategic goals/objectives/targets/priorities
- assessing the external environment (eg. social, political, economic issues)
- appraising the internal environment (eg. resources and capabilities)
- generating ideas for strategic initiatives/options
- evaluating strategic initiatives/options
- selecting strategic initiatives/options
- measuring/evaluating organisational performance
- implementing strategic decisions/strategic change.

Most of these methods are characterised by (1) structuring of issues in a problematic situation (Rosenhead, 1996), and (2) facilitating dialogue among decision-makers to develop constructive mutual commitments (Franco, 2006). This doctoral thesis explores, and debates, the use of modelling and simulation to support the deliberate internationalisation strategy of small organisations. In the small business literature, there is no convincing evidence of whether or not the strategy of small and medium-sized enterprises (SMEs) emerges either as a consequence of established plans or simply in the absence of intentions. Mintzberg and Waters (1985) argue that there is no pure deliberate or emergent strategy because the realised strategy is partly related to that which was intended. If intended strategies emerge as a consequence of the firm's strategic plan which is aligned to its vision and mission, the supporting strategy should help small firms to improve their strategic

plans. However, small firms do not have large quantities of resources to develop and update strategic plans. Therefore, in such companies, strategy seems to be mostly emergent. The supporting strategy of small firms should analyse the sequence of action that leads to a strategy. This analysis can encourage Chief Executive Officers (CEOs) to learn about their decisions. Modelling and simulation provide CEOs with a tool to improve their mental models of the strategy process. Moreover, modelling and simulation may allow CEOs to enhance their analysis of the ways in which they implement strategies and *open up* the spectrum of possibilities for setting the vision/mission, strategic objectives, performance measures and targets, as well as exploring, testing, revising, and selecting initiatives that leads to the enacting of strategy (Dyson, 2004).

In small firms the strategy process is designed and implemented mostly by the CEO because such firms have limited resources thus typically do not have large top management teams. Hence, strategic decisions are highly dependent on what the CEO plans to do in the future (Garg et al., 2003). However, most of the time CEOs do not have a clear intention to modify their strategy (Mintzberg and Waters, 1985). This characteristic of emergent strategies could be the reason why there is little evidence of supporting strategic decisions in small organisations. Historically, large companies have explored international activities as part of their life cycle because they possess a considerable set of resources for establishing activities within different countries (Birkinshaw, Morrison and Hulland, 1995). Nonetheless, in recent years, small companies have developed international activities despite their limited resources, thereby modifying the traditional scope of the internationalisation process (Oviatt and McDougall, 1994). One explanation for their success is that the managerial background characteristics of the CEOs lead to rapid internationalisation (Baum and Wally, 2003). Analytical reasoning supported by models (Dyson, Bryant, Morecroft and O'Brien, 2007) can provide CEOs with new insights and

ideas about how SMEs can improve the internationalisation process, as well as how the CEO's mental models of the internationalisation strategy can be rehearsed to create a positive impact on the firm's performance. Thus, the doctoral thesis represents a significant innovation within the OR/MS field because it extends the supporting strategy literature by helping individual decision-makers from international small firms.

1.2 Theoretical Positioning

A fundamental assumption in contemporary strategy is that the links between the firm's internal structure (e.g., goals and values, resources and capabilities, and systems) and its external environment allow managers to adapt the competitive environment and reach a sustainable competitive advantage (Grant, 2008). By analysing these links, managers can determine how the firm should accumulate and develop strategic resources to satisfy the firm's long-term goals, and to implement its strategies (Dierickx and Cool, 1989). In this view, business activities are contingent on external influences and respond to demands from the environment (Mintzberg et al., 2002). The industry environment represents the core of the firm's external environment and it is defined by the firm's relationships with customers, competitors, and suppliers (Grant, 1991). Nonetheless, a complete evaluation of the external environment as an objective representation is not feasible and embeds serious theoretical flaws. The external environment is uncertain and complex (Amit and Schoemaker, 1993), where the relationships among environmental factors are highly non-linear (Stermann, 2000). In this environment, it is not possible to predict the future of organisations (Lachmann, 1976). With such complexity and uncertainty, the external environment that managers face is causally ambiguous (Mosakowski, 1997; Powell, Lovullo and Caringal, 2006). This causal ambiguity means that managers find it difficult to make sense of the causal relationships between their decisions and their organisational outcomes (Lippman

and Rumelt, 2003b). Ambiguity delays managerial decisions (Adner and Helfat, 2003) and leads managers to be vulnerable to developing a poor understanding between the past decisions and their outcomes (Stermann, 1989b). In fact, managers who are affected by cognitive limits and biases (Hodgkinson et al., 1999) do not have a developed foresight about the future value of their resources. Hambrick and Mason (1984) extended this idea and suggested that bounded rationality affects managers in three ways: at the level of vision, perception and interpretation. First, bounded rationality limits the field of the manager, as he/she cannot comprehend all available information to make decisions. Second, a manager does not notice all the information within his/her field of vision. Rather, he/she will only notice the information that is interesting or valuable to them. Third, a manager attaches his/her meaning to the perceived information by storing the information based on his/her interpretation. This interpretation leads managers to have different strategic insights even in situations when similar analytical frameworks are used (Gavetti and Levinthal, 2004; Kunc and Morecroft, 2010).

The dynamic capability framework (Teece, Pisano and Shuen, 1997) embedded in the Resource-Based View of the firm (RBV) (Barney, 1991) offers a number of explanations of how managers can lead with cognitive limitations by building, integrating, and reconfiguring organisational resources as factors that enable their firms to achieve competitive advantages (Teece, 2007). Behavioural characteristics of decision-making (reflecting managers' cognitive problems) should be seen as a vital source of heterogeneous performance supplementary to valuable, rare, and difficult to imitate (VRI) resources (Alvarez and Busenitz, 2001). Kunc and Morecroft (2010) suggest that behavioural aspects of the RBV can be examined by decomposing the process of managerial decision-making in two stages: *the conceptualisation of resources* for implementing strategy; and *the management and development of resources* over time. Resource conceptualisation requires (1) information

collected by managers to inform strategy formulation, (2) the skills with which managers apply techniques to select strategies, and (3) the ability to correctly attribute the impact of new resource configurations on the firm's performance. Resource conceptualisation may create economic value for the firm by discerning VRI resources sooner than its competitors (Makadok, 2001). Resource development encompasses investment decisions and operating policies that guide asset stock accumulation. The description and analysis of the managerial decision-making process under a RBV is a promising way to provide the firm with guidelines on *where* and *how* to improve its capabilities (Kunc and Morecroft, 2010). The analysis of variation in resource accumulation and implementation strategies falls into one of the streams of System Dynamics (SD) research in strategy (Gary et al., 2008). This line of research emerged from the seminal work developed by Penrose (1959) which emphasises the importance of tangible and intangible firm-specific resource stocks, the associated accumulation processes, and the bounded rationality of managers (Dierickx and Cool, 1989; Morecroft, 1999; Sterman, 1989).

This doctoral thesis explores the use of SD modelling to help CEOs of SMEs to learn how the consequences of their resource conceptualisation and resource development can affect the performance of an internationalisation strategy. CEOs who have the ability to update mental representations in response to changes in the external environment are able to make better strategic decisions (Hodgkinson and Healey, 2011). SD modelling can provide CEOs with a learning mechanism to look ahead in order to anticipate possible futures (Kunc and Morecroft, 2007b). My view of supporting the strategy process proposes that CEOs can improve their mental models of the firm's resource system by modelling and rehearsing their internationalisation strategy. The modelling consists in facilitating the identification of strategic resources, causal relationships among resources, time delay effects, and feedback processes involved in the internationalisation process by building a

SD model. Simulations from the SD model provide the CEO with a tool for both assessing strategic ideas and learning from simulated performance. The doctoral thesis shows that it is possible to simulate the intended organisational actions in order to reflect on how these actions impact on the firm's performance. Moreover, strong evidence is presented to show how simulations of the CEOs' mental models can help them to react more effectively to unexpected changes in the external environment.

1.3 Research Objectives

The main objective of this doctoral research is to examine **whether and how reflective engagement and analytical reasoning supported by SD models can support the strategy of small organisations considering internationalisation strategies**. The above is operationalised under the following four research questions.

The first research question relates to the impact of the CEOs on the internationalisation of small firms. Even though Hambrick and Fukutomi (1991) suggest that the managers' tangible abilities are derived from both business experience and formal education, the impact on the internationalisation is not conclusive when small firms are located within markets with an underdeveloped production of high-technology products and low technical knowledge required for production. This is the case of commodity firms in Chile – and in most developing countries. I plan to conduct my doctoral research in this context. Therefore, my first research question is as follows:

Research Question 1: *What is the impact of the CEOs on the internationalisation processes of SMEs located within a developing country?*

After the extended literature review (Chapter 2), I realised that there is still considerable ambiguity with regards to how CEOs of SMEs develop their internationalisation process,

especially within developing countries (Knockaert et al., 2011). Hence, supporting the reflective engagement and analytical reasoning of the CEOs using SD modelling can help to explain how the CEOs perceive relevant resources and their implications for business performance. Research Question 1 focuses attention on the intrinsic characteristics of the subject of strategic decisions. Little documentation of how CEOs link strategic factors has been found in the literature, such as resources and their source of competitive advantage (Nadkarni and Barr, 2008). This gap has guided the formulation of my second research question:

Research Question 2: *How do CEOs of small firms manage their resources for implementing an internationalisation strategy?*

In SD, the mental model of decision-makers can explain their behaviour (Morecroft, 2007). Thus, the analysis of how CEOs model the internationalisation strategy can be used to sharpen the CEO's alternative views of the intended business. Once there is agreement (or at least accommodation) in supporting one or another view, SD modelling can help in exploring the solution space by rehearsing the preferred resource-building strategy through simulation (Kunc and Morecroft, 2007b). In the strategic management literature, there is an increasing interest in simulation-based research to understand the dynamism of the strategy process (Gaglio, 2004). Simulation methods facilitate applied research to explore the dynamics of the internationalisation process in SMEs, but this idea has not been analysed yet. Therefore, my third research question is:

Research Question 3: *How can SD modelling support the internationalisation strategy of small firms in practice?*

Khavul et al. (2010) argue that SMEs which export low-manufacturing commodities develop similar internationalisation processes. Therefore, models developed by CEOs should

show similar causal interconnections among strategic resources involved in the internationalisation processes. However, Kunc and Morecroft (2010) suggest that managers perceive the resource system available in their companies differently. Therefore, they can develop different strategies using similar resources. This theoretical suggestion encourages me to see if the SD models developed by CEOs have similarities by analysing the same internationalisation strategy. Therefore, my fourth research question is:

Research Question 4: *Are the CEO's mental models of the same internationalisation strategy similar in those firms with similar resources?*

1.4 Research Design

The selection of a research design depends on the nature of research objectives, the audiences for the study, and the researcher's personal experiences (Creswell, 2009). First, the aim of this doctoral project is to provide evidence that reflective engagement and analytical reasoning supported by SD models can support the internationalisation strategy of small organisations. The doctoral thesis adopts two approaches: (1) the analysis of survey information and (2) the use of cases/SD modelling interventions. In the first approach, Chapter 4 performs a multiple regression analysis to test four hypotheses related to the influences of CEOs on the firm's internationalisation process. Chapter 4 uses the information of 921 CEOs of small organisations provided by the Chilean National Institute of Statistics. The analysis of the survey addresses Research Question 1 and supports the use of formal training in enhancing the firm's internationalisation process. Nonetheless, the supporting strategy analysis needs to be grounded on a detailed examination of how to support CEOs in developing internationalisation process. Hence, the second approach consists of conducting five facilitated modelling processes to support the internationalisation strategy of five small organisations.

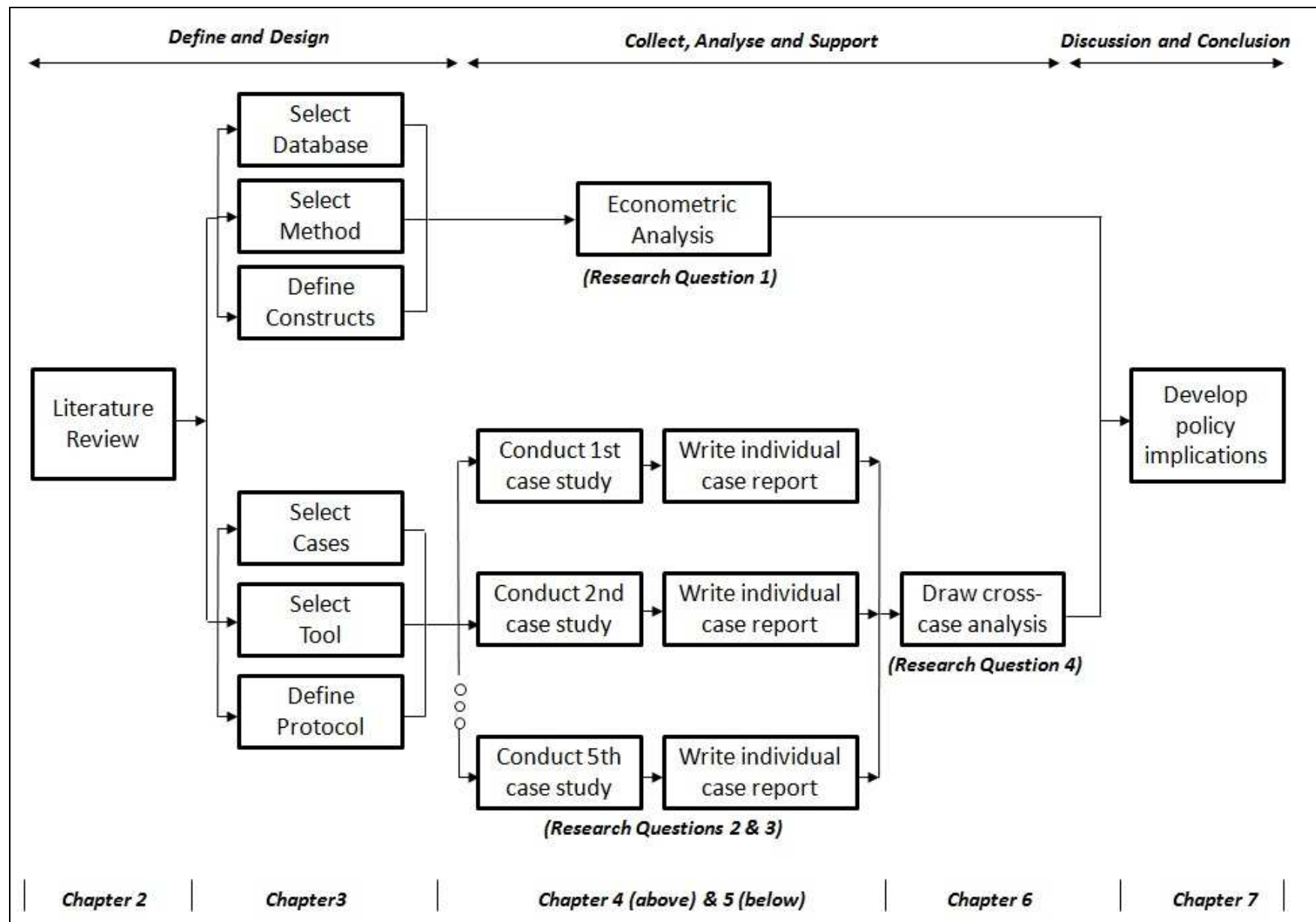


Figure 1.1: Road map of the doctoral dissertation

These companies are generically named LR, IW, CT, AF, and FT. Chapters 5 and 6 tackles Research Questions 2, 3, and 4 by showing and comparing the findings emerging across the cases. Figure 1.1 shows the road map that guides the doctoral inquiry.

Second, methods used to address the research questions are consistent with those used by scholars of international business and OR/MS studies. Multiple regression modelling has been consistently used to validate hypotheses about export performance among international SMEs (Khavul et al., 2010; Terziovski, 2010; Brouthers et al., 2009). On the other hand, SD modelling interventions have helped managers to understand how strategies will perform over time, what might be wrong and what kind of intervention can be done (Kunc and Morecroft, 2009).

Third, my personal experience working for export companies encourage my desire to study the phenomenon of international SMEs which achieve substantial international sales from an early stage. My background as an industrial civil engineer and my experience of developing consulting projects provided me with the analytical skills needed to perform both approaches of inquiry, and to carry out the statistic analyses, as well as the modelling and simulation research.

1.5 Thesis Outline

The purpose of the *Literature Review* in Chapter 2 is to reflect on core theories and approaches surrounding this doctoral research. Chapter 2 discusses worldviews within the strategy field and approaches for supporting strategy. Here, I explore the SD studies in the strategy field, and then the research framework is presented. Finally, Chapter 2 reviews internationalisation theories of SMEs which is the strategic process that is analysed along this doctoral thesis. Suggestions of how the internationalisation process of SMEs can be

shown as a strategic development process are detailed. These suggestions can be used to establish a bridge between OR/MS and IB studies.

Chapter 3 – *Methodology* – explains the research design, data collection, and data analysis procedures of this doctoral research. In Chapter 3, methodologies are presented in two sections. Section 1 details how the selection of the database, method, and constructs of the survey study are developed in Chapter 4. Section 2 shows how the selection of the case studies, the analytical tool for supporting strategy, and the protocol followed in each case are performed in Chapters 5 and 6. A detailed description of the profile of the case studies and their industries is developed in Chapter 3.

Chapter 4 – *Influences of CEOs during the Internationalisation of SMEs* – examines the influence of CEOs’ characteristics on the export intensity of small and medium-sized enterprises in Chile. Chapter 4 introduces four hypotheses which are related to the impact of CEOs on the firm’s export processes (e.g., tenure, education, background, and age). These hypotheses are tested using data from 921 SMEs located in Chile which was provided by the Chilean National Institute of Statistics. Finally, the results from the econometric analysis are shown, and their implications for the case study research are discussed.

Chapter 5 – *Supporting Strategy of Small Organisations* – describes how five CEOs of small companies conceptualised an internationalisation strategy from their mental models. This conceptualisation allowed CEOs to structure, simulate, and evaluate the potential consequences of their internationalisation strategy. Findings emerging from this conceptualisation provide evidence that SD modelling motivated the CEOs to discuss the current strategy and its likely outcomes. The CEOs’ reflections of modelling strategies provided opportunities for both assessing strategic ideas and learning from simulated performance.

Chapter 6 – *Mental Models of Internationalisation* – shows and discusses how the CEO’s mental models led to the development of the internationalisation strategy of the five case studies. These mental models were depicted by the CEOs during the interviews. The comparative analysis details the causal structures behind the common strategic resources, and provides evidence of the similarities in the cognitive patterns that lead to an internationalisation strategy across companies. Interesting facts that emerged from Chapter 6 were contrasted with the literature of small business studies. For example, the CEOs’ perception of the causal links concerning the resource system led them to develop the same internationalisation strategy (direct exports) differently, in firms that export the same product and have limited resources.

Chapter 7 – *Discussion* – analyses the findings described in Chapters 4, 5, and 6 in order to suggest lessons that can be learned in the theory and practice of OR/MS and IB studies. From this analysis emerged several lessons to theory and practice of OR/MS and IB studies. Chapter 7 details these lessons in three categories (1) lessons from modelling mental models, (2) lessons from learning about virtual performance, and (3) lessons from assessing strategic ideas in small companies. Finally, the development of policy implications for the SME internationalisation are shown.

Chapter 8 – *Conclusion* – discusses the contributions, implications, and limitations of the thesis. The first section summarises the thesis. The second section describes the empirical, theoretical, and methodological contributions of this research. The third section discusses the implications for research and practice in OR/MS and IB studies. The final section acknowledges the limitations of this thesis and suggests areas for future research.

Chapter 2

Literature Review

2.1 Introduction

The term *strategy* is a concept broadly used in management to refer an unifying theme that gives coherence and direction to the actions and decisions of an individual or an organisation (Grant, 2008). However, a relevant question emerges from this definition: How do strategies form in organisations? One of the first works that paid attention to this question was developed by Mintzberg and Waters (1985). They argued that the origins of strategies could be investigated by exploring the relationship between leadership plans and intentions and what the organisations actually did. Even though strategy is a business phenomenon embedded in the direction of companies, traditionally studies have paid more attention to the intrinsic characteristics of firms and managers rather than focus on describing the actions that lead to a strategy (Huff and Reger, 1987). Views about strategy are continuously changing within the management field because business strategy reflects what managers are actually doing in directing and managing their firms. This *doing* is affected by what is happening within the market, industry, and firms at a particular time. Therefore, the set of assumptions that define the nature of possible

research also depends on such factors. This set of assumptions – called paradigms (Mingers and Brocklesby, 1997) – lead scholars to develop different theories and frameworks about strategy. In this section a review of theories and frameworks for explaining and supporting strategy will be reviewed.

Chapter 2 is structured in five parts: Section 2.1 introduces the main theories behind contemporary strategy. Section 2.2 discusses worldviews within the strategy field and approaches for supporting strategy. Section 2.3 explores the SD studies in the strategy field. Section 2.4 reviews internationalisation theories of SMEs which is the strategic process that is analysed within this doctoral thesis. Here, suggestions of how the internationalisation process of SMEs can be shown as a strategic development process are detailed. Finally, the research framework is presented in Section 2.5.

2.1.1 Contemporary Strategy

Traditionally, the strategic management field has developed different methods and models for explaining *how* and *why* certain firms implement strategies to build competitive advantage (Barney, 2001) and to achieve a superior firm performance (Kunc and Morecroft, 2010). Ideas about innovation-based competition, price/performance rivalry, increasing returns, resources and capabilities have dominated the frameworks that explain the firm-level success and failure (Teece et al., 1997). The dominant paradigm in the field evolved from the structure-conduct-performance paradigm (Mason, 1949) to the efficiency and effectiveness paradigm (Wernerfelt, 1984). In the 1980s, it was commonly accepted the competitive forces approach developed by Porter (1980) that emphasises the actions that a firm can take to create defensible positions against competitive forces of the market (e.g., competitive rivalry within an industry, bargaining power of suppliers, bargaining power of customers, threat of new entrants, and threat of substitute products). Complementary

within this initial paradigm, emerged the strategic conflict approach (Shapiro, 1989) which focused on the market imperfections, entry deterrence, and strategic interaction. However, Wernerfelt (1984) opened an older debate in the strategic planning field asserting that firms build enduring advantages only through efficiency and effectiveness. One of the prominent works in this debate was developed by Rumelt (1984) who applied the resource perspective to the strategy. Rumelt (1984:561) suggested that a firm ‘is characterised by a bundle of linked and idiosyncratic resources and resource conversion activities’. Later, this perspective was referred to as the resource-based view of the firm (RBV) and defined a *resource* as strategic assets owned by the firm (Barney, 1986; Grant, 1991). According to Teece et al. (1997:510), this perspective ‘emphasises firm-specific capabilities and assets and the existence of isolating mechanisms as the fundamental determinants of firm performance’. In fact, Barney (1991:101) suggests that the resource-based view of the firm substitutes two alternate assumptions in analysing sources of competitive advantage. ‘First, this model assumes that firms within an industry (or group) may be heterogeneous with respect to the strategic resources they control. Second, this model assumes that these resources may not be perfectly mobile across firms, and thus heterogeneity can be long lasting. The resource-based model of the firm examines the implications of these two assumptions for the analysis of sources of sustained competitive advantage’. Within this stream, Teece et al. (1997) add another component of the RBV theory by explaining how combinations of competencies and resources can be developed, deployed, and protected. They refer to this as the *Dynamic Capability* approach. This approach explores ‘the development of management capabilities, and difficult to imitate combinations of organisational, functional, and technological skills’ (Teece et al., 1997:510). The dynamic capability approach provides a framework to understand how managers develop unique capabilities that allowed the firm to earn a rate of return in its capital that exceeds its cost of capital over the long term (Grant, 2008).

According to Porter (2004) this is possible either to locate within an attractive market or to obtain a position of advantage over rivals within an industry. These two ways to achieve a superior performance define two basic levels of strategy within a company: *corporate strategy* and *business strategy*. Grant (2008:19) suggests that ‘corporate strategy defines the scope of the firm in terms of the industries and markets in which it competes (*where to compete*). Corporate strategy decisions include investment in diversification, vertical integration, acquisitions, new ventures; the allocation of resources between the different businesses of the firm; and divestments [...] (In contrast,) business strategy is concerned with how the firm competes within a particular industry or market (*how to compete*). If the firm is to prosper within an industry, it must establish a competitive advantage over its rivals’.

2.1.2 Worldviews about Strategy

Different perspectives and frameworks that exist in the literature increase the complexity of classifying strategy research. According to Hutzschenreuter and Kleindienst (2006), some of these studies are classified as *descriptives* focused on observed patterns of behaviour of organisations (Lovas and Ghoshal, 2000; Miles and Snow, 1986), and others are *prescriptive* concerned with understanding the process of developing strategy by practitioners (Farjoun, 2002; Mintzberg, 1994). Also, strategy studies can be classified at an individual level (Hambrick and Mason, 1984), at a group level (Golden and Zajac, 2001), and some at an organisational level (Dyson, 2004).

Alternatively, a broader approach is to differentiate between *strategy content* and *strategy process*. According to Huff and Reger (1987) content research is focused on the subject of the strategic decisions itself. Subjects such as acquisition; entry, exit, and mobility barriers; product/market differentiation; vertical integration are commonly analysed in this area.

This kind of research has given considerable attention to defining similarities and differences among strategic units within the firm, among strategic groups within industries, and among firms in similar circumstances. By contrast, strategy process research is primarily concerned ‘with the actions that lead to and support strategy’ (Huff and Reger, 1987:212). Strategy process is understood as an organisational process consisting of a number of activities, including deciding where you want to go; examining what may lie ahead; choosing between options; setting targets; planning how to move in the direction you want to and checking progress along the way (O’Brien, 2011). Currently, this approach centring on *the process* has gained acceptance in OR/MS research communities. However, a particular theoretical tension emerges at the moment of differentiation whether the strategy is either deliberate (realised as intended) or emergent (in the absence of intentions). Mintzberg and Waters (1985) guide this debate by suggesting that for a strategy to be perfectly deliberate – that is, to plan strategy exactly as intended – at least three conditions would need to be satisfied: (1) there must have existed precise intentions in the organisation of developing a particular strategy; there can be no doubt about what was desired before any actions were taken. (2) Strategies must have been common to virtually all actors involved. (3) No external forces such as market, technological, or political must affect the intended strategy. On the other hand, Mintzberg and Waters (1985) suggest that for a strategy to be perfectly emergent, there must be order – consistency in action over time – in the absence of intention about it. Mintzberg and Waters (1985) clarify that no consistency means no strategy or at least unrealised strategy.

It is difficult to imagine how managers can implement either purely deliberate or emergent strategy. Indeed, Grant (2008) suggests that the realised strategy is only partly related to that which was intended because managers have limited rationality – they cannot comprehend all available information to make decisions (Hambrick and Mason, 1984). In fact,

Grant (2008:22) highlights that ‘the intended strategy is the result of a process of negotiation, bargaining, and compromise, involving many individuals and groups within the organisation’. Relevant to this debate, Jarzabkowski (2003) suggests that strategy is being continually enacted through decisions, and as a consequence of formal strategic practices involved in direction setting, resource allocation, monitoring, and control. For example, the decentralised, bottom-up process of strategy emergence may lead to formal, top-down strategy formulation (Grant, 2008). A classic example of this situation was provided by Burgelman and Grove (1992) who showed that Intel’s historical decision to abandon memory chips and focus on microprocessors was taken by divisional managers that was later accepted and promulgated by the top management team.

2.1.3 Approaches for Supporting Strategy

The theoretical work developed by Huff and Reger (1987) opened up new streams of research on the process which lead to and support strategy. However, the flexible definition of *strategy process* defined by Huff and Reger (1987:212) as ‘the process which is primarily concerned with the actions that lead to and support strategy’ triggered scholars to build their analysis on those activities perceived as relevant to strategists. For example, Mintzberg (1994) emphasises that the strategy process involves the analysis of the internal and external environment and the formulation and implementation of strategy. Activities related to business direction, such as the identification of strategic issues, and the setting of strategic goals, objectives, and priorities were included later as part of the strategic management approach (Mintzberg et al., 2002). Similar approaches were developed by McGee, Thomas and Wilson (Strategy Analysis and Practice), Grant (2008) (Contemporary Strategy Analysis), and Miles and Snow (2003) (Organizational Strategy, Structure, and Process).

On the other hand, another prominent stream of research in the area of strategy process was built on the OR/MS approaches. Dyson et al. (2007) suggest a comprehensive model called the Strategic Development Process (SDP) which extends the strategy process to incorporate reflective engagement and analytical reasoning supported by models. The SDP includes feedback control models that allow to test strategic options before implementing them into the organisation (O'Brien and Dyson, 2007). Using this approach, managers can visualise the outcome of strategic options virtually and compare them with the direction and goals of the firm. Virtual (simulated) performance provides opportunities for creating, assessing, and modifying strategic ideas and learning from expected business dynamics. The SDP consists of the following activities: direction, creation, rehearsal, evaluation, and choice (Dyson et al., 2007). According to Dyson et al. (2007:14) ‘**Direction** encompasses setting the vision/mission, strategic objectives, performance measures and targets. The activity of *Direction* includes the analysis of strategic objectives and targets which can be modified in the following activities of the SDP. **Creation** may encompass sense-making, visioning and strategic initiative/option development. **Rehearsal, evaluating and choice** would cover exploring, testing, revising and selection leading to the enacting of strategy’.

Rigby and Bilodeau (2007) performed a survey that explores those tools used for executives within the strategic management perspective. Executives reported eight tools, of which customer relationship management, customer segmentation, and benchmarking were the most popular ones. Another survey was developed by Stenfors et al. (2007) which asked executives to list all the strategy tools used to make strategic decisions in their companies. This survey showed that SWOT analysis, balanced scorecard, and risk analysis were the most popular tools, but also it reported some OR/MS tools related to statistical analysis, optimisation and simulation. Tools from the OR/MS approach provide analytical models for supporting strategy. Tapinos (2005) in his doctoral thesis included a survey study in

which he asked MBA alumni about tools for supporting strategy. SWOT analysis, benchmarking, cost benefit analysis, and core capabilities were the most widely reported. A fourth survey study was developed by O'Brien (2011). This study explores two research issues from the strategy as practice community (strategic actors and tools used). Examining the strategic actors involved, this research suggests that the head of the strategic planning team regularly undertakes or provides support for most of the strategic activities. These activities involve setting directions; appraising the internal environment; generating, evaluating, and selecting options; and implementing strategic decisions. The following tools: cost benefit analysis, financial analysis/modelling, statistical analysis, benchmarking, and brainstorming, obtained the highest median score between private and public sector respondents. Table 2.1 summarises the tools that emerged from these four survey studies received by OR/MS practitioners.

In the same way that the OR/MS audience divides tools based on the degree of analytical procedures, O'Brien (2011) classifies the OR/MS approaches for supporting strategy as *Hard* and *Soft* OR/MS approaches. Even though soft OR/MS approaches have emerged in response to criticism of traditional mathematical OR/MS models were focused on optimisation problems rather than dealing with important executive-type decisions (Daellenbach and McNickle, 2005), Table 2.1 shows that the number of hard OR/MS tools used by practitioners to support major decision-making processes is larger than the number of soft OR/MS tools. In order to differentiate *Hard* and *Soft* approaches in the strategy arena, Pidd (2003) suggests four distinctions:

- Problem definition
- The nature of organisational life
- Models as representations

Table 2.1: OR/MS tools coverage in four previous studies (Adapted from O'Brien (2011))

Tools	Studies				
	Rigby Bilodeau (2007)	and (2007)	Stenfors (2007)	et al.	Tapinos (2005) O'Brien (2011)
<i>Strategic Management tools</i>					
Benchmarking	✓				✓
Brainstorming			✓		✓
Core competencies	✓				✓
Customer Relationship Management	✓				✓
Balanced Scorecard	✓		✓		✓
Delphi					✓
Enterprise resource planning			✓		
Knowledge management	✓				
PEST analysis					✓
Porter's five forces					✓
Portfolio matrices					✓
Resource-based planning					✓
Scenario planning	✓		✓		✓
Six sigma	✓				
SWOT analysis			✓		✓
Value chain analysis			✓		✓
Visioning approaches					✓
<i>Hard OR/MS tools</i>					
Agent-based models					✓
Capital investment appraisal					✓
Cost benefit analysis					✓
Data mining					✓
DEA/efficiency evaluation					✓
Decision analysis					✓
Forecasting					✓
MCDA (multi-criteria decision analysis)					✓
Optimisation/LP			✓		
Project management tools			✓		
Quality methods			✓		✓
Risk analysis			✓		✓
Simulation			✓		✓
Spreadsheet applications			✓		
Statistical analysis			✓		✓
System Dynamics					✓
<i>Soft OR/MS tools</i>					
Analytical hierarchy process					✓
Cognitive mapping/SODA/Journey making					✓
Influence diagrams					✓
Stakeholder analysis					✓
Soft systems					✓

✓ indicates that a tool was listed in the study

- Outcome as product or as learning

Problem Definition

Commonly in hard OR/MS approaches, the work begins once a need or requirement is established, and the effort is focused on the answer to this problem. In contrast, soft OR/MS approaches begin with the assumption that problems are socially constructed and are the result of how we make sense of events by employing a scheme of interpretation (Mingers, 2003a). Hence, a problem definition is itself an issue within the solving process. In fact, soft OR/MS tools assume that people's perceptions of the real world are unsettled, and therefore, the problem definition is seen as multifaceted. Another distinction is that the hard approach assumes a well-defined problem, but the soft approach assumes that the problem definition will emerge through discussion.

The Nature of Organisational Life

Pidd (2003) suggests that the soft OR/MS approach conceives the organisation as a group of people with different preferences that make decisions following their intentions. In contrast, hard approaches are dominated by a *positivism logic*, in which people are organised according to their functions and most of their organisational processes can be optimised (Rosenhead and Mingers, 2001). Although both approaches are essentially about taking actions, soft approaches have emerged from social theories rather than engineering analyses (Mingers, 2003a), such as Kelly's psychological theory (e.g., Strategic option development and analysis, SODA) (Eden and Ackermann, 2001), the philosophy of Kant and Habermas (e.g., Critical system heuristics) (Ulrich, 1994), Ashby's ideas of control and variety (e.g., Viable system model, VSM) (Beer, 1979), and classic economic game theory of Von Neumann (e.g., Drama theory) (Bennett et al., 2001).

Models as Representations

All OR/MS methodologies share the idea of developing models of aspects of the situation, but differ in terms of what it is that they form models of (Mingers, 2003*a*). In a hard approach it is typically assumed that a model is a would-be representation of part of the real world. It is accepted that the model will be a simplification and an abstraction of the real world (Pidd, 2003). For that reason, it is essential that the model and its operationalisation must be validated against the part of the real world being modelled. If there is not enough support for validating the model's output, this must be improved. On the other hand, the idea behind soft approaches is that models are developed so as to allow people to think through their own positions and to engage in debate with others about possible action (Mingers and Brocklesby, 1997). Hence, the main concern of soft approaches is that decision-makers find models helpful in mapping out a problematic situation as they perceived it. Although, Pidd (2003) argues that validation processes are a problematic issue for soft models, he emphasises that soft models are concerned with defining a problematic situation, and if this task is completed, confidence has no place in the model.

Outcome as Product or as Learning

Even though both approaches may have tangible products and learning, such as the development of computer software or a set of recommendations, the soft approaches stress that, 'when people face problematic situations, this is a chance for them to learn how to cope with such circumstances in such a way that their performance is improved' (Pidd, 2003:109). Hence, the outcome emerges from the learning involved in developing the approach (Rosenhead, 1996). In contrast, in hard approaches the outcome is the product itself, and the learning process emerges from its analysis.

In summary, these four distinctions allow us to identify an essential dimension of models for supporting strategy. If the strategic phenomenon of interest is modelled as a physical process, which is possible in quantifying and defining boundaries, it can be classified as a model based on a physical representation of reality. Examples are the optimisation and statistical approaches, such as linear programming models, statistical analysis, and MCDA. In contrast, if the strategic phenomenon of interest is modelled as an individual or social construction process, it can be classified as a model based on the mental representation of reality. Figure 2.1 shows how the tools for supporting strategy reported by OR/MS practitioners (See Table 2.1) can be classified according to (1) the nature of the strategy orientation, such as whether the OR/MS and strategy approaches are focused on deliberate/emergent issues, and (2) the nature of the process which is analysed, such as models based on physical representations of reality, or models based on mental representations of reality.

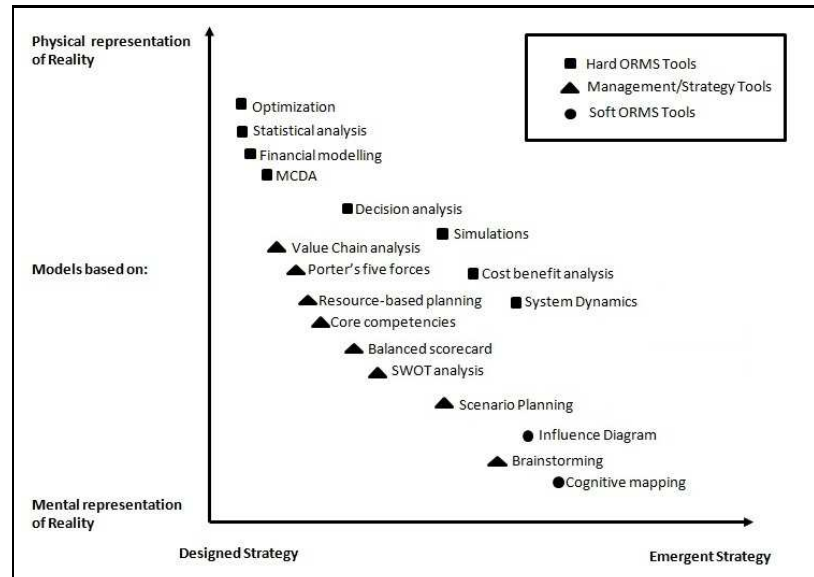


Figure 2.1: Tools for supporting strategic development processes reported by OR/MS practitioners

Many realised strategies are a combination of designed and emergent strategies (O'Brien, 2011). Therefore, there is a need to use tools to support deliberate aspects but also to cater for the emergent. Most of the hard OR/MS tools focus on supporting deliberate aspects of strategy, such as planning resources, minimising time delays and costs, and analysing the market's opportunities statistically. Hard tools which are based on an optimisation paradigm are embedded in positivist theories of the organisations (Mingers, 2003a). The analysis of the emerging aspects of the strategy is limited to the restriction of each tool, and the expert's capacity to count relevant variables (Mingers, 2006). The softer line of hard tools involves approaches which represent the problem through a mathematical formulation but their models represents reality boundedly – an interpretivist view of organisation. One of the OR/MS tools with higher changes within hard OR/MS tools is System Dynamics. Although System Dynamics was created by Jay Forrester based on ideas of control theory and mathematical modelling, in the last 10 years, several scholars, such as John Morecroft (London Business School), John Sterman (MIT Sloan School of Management), Peter Senge (MIT Sloan School of Management), Martin Kunc (Warwick Business School), David Lane (London School of Economics), Kim Warren (London Business School), Brian Dangerfield (Salford Business School), Geoff Coyle (Bath University), Shayne Gary (Australian School of Business), and Nelson Reppening (MIT Sloan School of Management) have extended SD beyond traditional models of urban dynamics and supply chain management. The radical change in this discipline was to focus on mental representations of the reality in supporting strategic issues within organisations (Senge, 2006). This change has been triggered by the emancipation of soft OR/MS applications in strategy (Rosenhead, 1996). Soft approaches are used by practitioners to model mental representations of a problem or situation rather than to depict an objective representation of environment. Most soft tools are able to analyse emerging aspects of the strategy because these arise as a consequence

of the dialogue between decision-makers. The most representative soft tools are causal maps (influence diagrams) (Eden, Ackermann and Cropper, 1992) and cognitive maps (Eden, 2004). The most significant characteristic of these soft tools is to facilitate the management of messy problems by management teams (Eden and Ackermann, 2004) – that is, an emergent aspect of strategy. Management/strategy tools are more diverse because some of the tools have been created based on an economic perspective (e.g., balanced scorecard, Porter’s five forces, and value chain analysis) but others from a consulting or business viewpoint (e.g., scenario planning, and brainstorming). The diversity of such tools was caused by shifts in the strategy field, from the analysis of the organisation’s external environment (Porter, 1980) to those which consider the firm’s internal resources and capabilities (Eisenhardt and Martin, 2000).

2.2 System Dynamics & Strategy

Work at the intersection of System Dynamics (SD) & Strategy has been consistently published in high-impact OR/MS and management/strategy journals (Kunc and Morecroft, 2010; Gary and Wood, 2011; Sterman et al., 2007; Gary, 2005; Repenning, 2002; Lane, 1999; Morecroft, 1984). The evolution of SD in the strategy field has been triggered by the criticisms of serious theoretical and pedagogical flaws, such as by separating the problem behaviour from the structure alleged to cause it; by ignoring and misunderstanding scale and timing of behaviour; by having inaccuracy in model predictions; and by excluding unavoidable properties of asset stock accumulation (Warren, 2004). Nonetheless, the strength of SD in strategy is to allow the understanding of a feedback system’s view of the organisation where the manager can reflect on *how he/she has developed current strategies, what has happened in his/her organisation, what to do, when, and what would be the impact of strategic initiatives on firm performance prior to implementation*. Aligned to

these strengths, Gary et al. (2008) suggest that opportunities for SD research in strategy fall into four streams:

1. Laboratory experiments of individual and team decision-making.
2. Bootstrapping decision rules using numerical data from the field.
3. Dynamics of competitive rivalry.
4. Variation in resource accumulation and implementation strategies.

The first stream highlights the opportunities in developing experimental work on managerial decision-making. SD research on dynamic decision-making has focused on identifying and documenting systematic misperception of feedback and causal ambiguity between decisions and the environment (Sterman, 1989; Repenning and Sterman, 2002; Langley and Morecroft, 2004; Senge and Sterman, 1992). The second stream has focused on understanding how managers' decision rules can be estimated from data on decisions and the information available to managers at the time they made those decisions (Gary et al., 2008). The third line of inquiry uses game theory models of competitive rivalry to examine the potential consequences of decisions among rivals (Sterman et al., 2007). Finally, the analysis of the dynamics of resource accumulation provides the fourth way to develop SD research in strategy. This line of research emerged from the work of Penrose (1959), and emphasises the importance of tangible and intangible firm-specific resource stocks, the associated accumulation processes, and the bounded rationality of managers (Dierickx and Cool, 1989; Morecroft, 1999; Kunc and Morecroft, 2010). This last stream is also associated with the literature on strategic development processes under a Resource-Based View paradigm (Kunc and Morecroft, 2007b). By analysing the internal resources, a firm can plan the deliberate aspects of the strategy that are related to where the firm is able to compete efficiently (Barney, 1986). SD can help managers handle the portfolio of resources by

modelling their mental representation of the resource system available to make strategic decisions (Kunc and Morecroft, 2009).

2.2.1 SD Modelling for Supporting Strategy

Commonly, strategy has been conceived in terms of what the leaders of an organisation *plan* to do in the future (Mintzberg and Waters, 1985). Nonetheless, it is difficult, even for experienced managers, to develop a strategy process when the future of an organisation is subject to inter-relatedness of the decision-making context; significant time lag before impact; with widening uncertainty over the timescale involved in a decision; and disagreement about the motivation for, and the direction (and nature) of, strategic decisions within organisations (Dyson et al., 2007). Although it is impossible for managers to be sure how their decisions will change their future performance, the development and use of rational and logical analysis can be a greater aid in managing the complexity and in recognising and managing the inevitable risk of making strategic decisions (Morecroft, 2007).

Within the SD field, the logical analysis is based on representations of reality called *models*. These representations capture the reality partially, because for the observer that reality does exist in a form external to him/her. Hence, modelling of reality is still not straightforward, and depends on the observer's perception about what he/she is observing (Rosenhead and Mingers, 2001). However, models are popular because they are explicit and can be tested by other people. In SD, models and simulators – called Microworlds by Morecroft (1988) and Senge (2006) – compress time and space, allowing managers to experiment and learn when the consequences of their decisions are in the future and in distant parts of the organisations (Kunc and Morecroft, 2007b). In recent years, different SD studies have used modelling for supporting strategic issues (Gary et al., 2008). System Dynamics research can develop theories through modelling and simulating strategic issues

about firms. Sterman et al. (2007) show an example of modelling strategic behaviour using System Dynamics. The simulation shows that when an industry moves slower than the firms' capacity to cope with adjustment delays, bounded rational firms find their way to the equilibria predicted by conventional models. However, when market dynamics are faster than the adjustment capacity, forecasting errors lead to the supply shortage, which, in turn, causes loss of the potential sales. Also, from SD modelling, it is possible to learn about the strategy process. Repenning and Sterman (2002) find that the critical determinants of organisational success are the interactions between managers' attributions about the cause of poor organisational performance and the physical structure of the workspace. Another way to use SD modelling for supporting strategy is to analyse how firms can implement strategy. Gary (2005) builds a System Dynamics model for analysing the implementation of a diversification strategy. Gary's findings suggest that successful diversification strategies require managerial policies that maintain organisational slack. In the absence of such policies, related diversification can negatively impact firm performance. Additionally, SD modelling has been used to understand the unintended consequences of the strategy adopted in the UK steel industry (Dangerfield and Roberts, 2000) and in European health care services (Dangerfield, 1999; Taylor and Dangerfield, 2005).

On the other hand, different SD studies have used modelling to investigate managerial decision-making behaviour. Use of behavioral simulation allows researchers to closely examine the decision-making process (Cavaleri and Sterman, 1997). The extended use of microworld simulators, such as Fish Bank, People Express, and Oil Game confirms the popularity of this approach (Kunc and Morecroft, 2009; Langley and Morecroft, 2004). For example, Kunc and Morecroft (2010) ran an experiment using the popular fisheries simulator called Fish Banks, Ltd. Their findings suggest that in repeated simulation experiments, even though young executives managed an identical resource, they generated

vast differences in performance. A similar finding was found three years earlier by Kunc and Morecroft (2007a). They argue that leaders and firms within the same industry can adopt quite different views towards the overall resource system in the industry. Thus, it is important to model the heterogeneity of rival firms in order to understand the dynamic performance of the firm. In the same way, but using an oil simulator, Langley and Morecroft (2004) conclude that poor performance arises from decision-makers' failure to correctly interpret feedback information due to the confounding effects of stock accumulation; time delays between decisions and actions; and non-linearity between system elements. The use of behavioral simulation has provided beneficial insights on the managerial decision-making processes. Nonetheless, the findings that emerge from such artificial environments are limited due to the lack of relevancy to the real environment which decision-makers face.

The literature also provides examples of approaches which are related to SD thinking and strategy. For example, Kunc and Morecroft (2009) propose an approach called *Resource Maps* that can be used to interpret managerial mental models for strategic decision-making in terms of resource-building processes. Through resource maps, managers can represent the system of asset stocks believed to be most important for driving business performance. This approach is based on system dynamic modelling. However, the main concern of this approach is to deal with disagreement at the moment of implementing distinct resource-building strategies. Hence, here models emerge from conversation of the strategic resource system perceived by managers rather than from the formal process of modelling physical resource systems. Even though Kunc and Morecroft (2009) suggest that resource mapping can be used during the problem conceptualisation followed by traditional system dynamics modelling (Forrester, 1994), resource maps offer a scope for negotiation and dialogue about the purpose of strategy. Another example is provided by Eden and Ackermann (2000) who contribute to the domain of system thinking and strategy, thereby developing strategic

direction through the use of models and group support systems. By mapping distinctive competencies they analyse the relationship between patterns of competencies and the goals of an organisation. Warren (2008) suggests another approach called *Strategic Architecture* that uses SD diagrams to explain how the firm's performance changes over time through the identification of resources, external factors, certain management choices, and the process of accumulating and depleting the resources. Powell and Coyle (2005) suggest another method for the study of strategy in the context of feedback which is called qualitative politicised influence diagrams (QPID). The QPID method allows researchers to identify different strategies by mapping the decision-makers' knowledge in an organisation.

Table 2.2 summarises those studies at the intersection of SD & Strategy. As I described above, these studies show essential elements for supporting some of the activities of the strategic development process (Dyson et al., 2007). Most SD studies have focused on evaluating strategic initiatives (Evaluation) rather than developing the vision/mission and strategic objectives of the organisation (Direction) or supporting managers to implement a strategy (Choice). However, when SD modelling is combined with other OR/MS approaches, the result generates complementary insights that allow to cover more elements of the strategic development within a single study.

2.2.2 Mixing SD Modelling with OR/MS Approaches

Mixing SD modelling with OR/MS approaches for supporting strategy helps managers to think strategically about the future, in situations exhibiting high levels of conflict, complexity and uncertainty (Bryant et al., 2007), or when the activities of the strategic development process are not clearly established within the organisation. Mingers and Brocklesby (1997) suggest two main arguments in favour of combining OR/MS methods. Firstly, real-world problems are highly complex and multidimensional. Strategic problems emerge from or-

Table 2.2: Recent studies using SD modelling for supporting strategy

Article	Strategic process	Approach	Direction	Activities of the Strategic Development Process			
				Creation	Rehearsal	Evaluation	Choice
<i>Studies using SD modelling</i>							
Kunc and Morecroft (2010)	Managerial decision-making	System Dynamics				✓	
Sterman et al. (2007)	Strategic behaviour	System Dynamics				✓	
Kunc and Morecroft (2007a)	Competitive behaviour	System Dynamics				✓	
Ahlström et al. (2007)	Strategy process	System Dynamics			✓	✓	
Gary (2005)	Implementation of a strategy	System Dynamics			✓	✓	
Taylor and Dangerfield (2005)	Strategy process	System Dynamics				✓	
Langley and Morecroft (2004)	Managerial decision-making	System Dynamics				✓	
Repenning and Sterman (2002)	Organisational Learning	System Dynamics			✓		
Dangerfield and Roberts (2000)	Strategy process	System Dynamics				✓	
Dangerfield (1999)	Strategy process	System Dynamics				✓	
Cavaleri and Sterman (1997)	Strategy process	System Dynamics				✓	
Senge and Sterman (1992)	Organisational Learning	System Dynamics			✓		
Coyle (1992)	Strategy process	System Dynamics				✓	
Morecroft, Lane and Viita (1991)	Strategy process	System Dynamics			✓	✓	
<i>Other approaches related to SD</i>							
Kunc and Morecroft (2009)	Strategic decision- making	Resource Mapping		✓		✓	
Warren (2008)	Strategic decision- making	Strategic Architecture		✓		✓	
Powell and Coyle (2005)	Managerial decision-making	QPID		✓			
Eden and Ackermann (2000)	Strategic direction	Causal/Cognitive Mapping	✓				
<i>Mixed SD and other approaches</i>							
Howick and Eden (2011)	Strategic decision- making	Causal Maps and System Dynamics				✓	✓
Burt (2011)	Strategic direction	Scenario Planning and Influence Diagrams	✓			✓	
Ackermann et al. (2010)	Group decision-making	Group Support System and System Dynamics		✓			
Nielsen and Nielsen (2012)	Strategic decision	Balanced Scorecard and System Dynamics				✓	✓

organisational interactions of multiple actors with multiple perspectives, incommensurable and/or conflicting interests, and key uncertainties (Mingers and Rosenhead, 2004). Hence, some approaches can reveal certain aspects but are completely blind to others. For example, SD modelling allows the evaluation and rehearsal of strategies using equations and stock-and-flow diagrams, but these elements of modelling are quite strict when managers want to show some qualitative aspects of their decisions, such as dreams, expectations, fears, and doubts (some SD approaches can include qualitative variables, but they are not able to run simulations). Secondly, an intervention is not usually a single, discrete event but a process that typically proceeds through a number of phases. Some methods tend to be more useful in relation to some phases than others. It is clear that SD modelling is useful during the rehearsal and evaluation, but other soft OR/MS approaches are better in creating vision/mission statements or strategic initiatives.

Certainly, this suggestion of combining approaches is even more relevant when managers are confronted by strategic issues that may well be messy, but which also have significant quantitative aspects (Bennett et al., 1997). Table 2.2 shows some studies mixing SD modelling with OR/MS approaches for supporting strategy. Howick and Eden (2011) describe a strategy-making intervention with a top management team within the UK police force, where a soft OR strategy-making process was used to feed into the development of a system dynamics model that explored tensions between the supply of resources (police officers), and the demands placed upon those officers. In the same way, Burt (2011) describes an intervention that combines scenario planning and system modelling to support the exploration of uncertainty in the UK energy sector. He shows how systems modelling can complement and enhance the narrative power of scenarios by making explicit the interconnected and dynamic nature of past, present, and future realities. Ackermann et al. (2010) provide another example of combining approaches. They use a group decision support

system to define the problem boundary and then they support a group of decision-makers to link dynamic structure with system behaviour and analyse a micro and a macro view of system structure. Finally, Nielsen and Nielsen (2012) developed a research study where they combined SD modelling with balanced scorecard to evaluate the financial results of different planning and strategy scenarios in an organisation.

This group of studies shows some issues that can guide researchers when it is appropriate to combine SD modelling with other OR/MS approaches. SD modelling and hard OR/MS approaches requires a good analytical mind and background familiarity with mathematics and computing skills, while soft methods require people skills and the ability to facilitate often stressful and contentious workshops (Munro and Mingers, 2002). Another issue is understanding the relationship between the researcher and the clients (Bryant et al., 2007). If the researcher expects to be a facilitator, the process will be guided to discover the problem rather than to find solutions (expert role) (Howick and Ackermann, 2011). In this case, soft OR/MS approaches can be used during early phases of problem structuring to enrich the conceptualisation step of the SD modelling. Bennett (1985) called this approach *enrichment*. Another way to combine methodologies is in *addition* (Bennett, 1985). Pollack (2009) explored this approach in the light of an information systems strategic planning project in the Australian public sector. He distinguished between multimethodology in *series* and in *parallel*. His reflections suggest that parallel multimethodology gives the opportunity to adapt the paradigm used in a situation, and to consciously reflect on its applicability to a particular point in an intervention, independent of the technique that is being used at that time. In contrast, a parallel approach to multimethodology allowed for the qualities of both approaches to be applied throughout the project, as needed. Finally, Mingers (2003b) identified a third way of combining methodologies. He called it *integration* when two or more approaches provide something new. This way opens new streams for

combining SD and management/strategy methodologies.

2.2.3 Supporting SME's Strategy using SD Modelling

One of the main contributions of SD modelling to strategy is to show how the structure of decision-making drives behaviour (Morecroft, 2007; Schaffernicht and Groesser, 2011). The literature provides evidence of the success of SD modelling for supporting managerial group decisions. However, SD scholars have paid little attention to those small firms where the decision-making process is carried out by one Chief Executive Officer (CEO). This is the case of most small and medium-sized enterprises (SMEs) and start-up firms. Although Forrester (1961) in an early writing argued that SD would be most helpful to small firms, little evidence of supporting strategic decisions in SMEs using SD modelling was found in the SD literature. In the course of this research only three works of applying SD in small and medium-sized business management were found in the last 20 years – those developed by Ahlström et al. (2007), Morecroft et al. (1991), and Senge and Sterman (1992). Ahlström et al.'s book is an interesting work that attempts to explain the cause-and-effect relationships between small business growth policies and their sustainability. However, the book focuses on the corporate planning context which has the flaw of developing long-term planning documents that set goals and objectives, and which forecast key economic trends, rather than supporting managers in order to improve strategic decisions of *how* and *where* to compete (Grant, 2008). The article developed by Morecroft et al. (1991) shows the process of modelling the growth strategy of a biotechnology start-up firm. Morecroft et al. describe how models evolve, how project team members participate, how their ideas are captured and mapped, and how simulations are used to challenge the team's intuition about policy options and consequences. Finally, Senge and Sterman (1992) reports how a medium-sized company can improve quality and total cost performance in the insurance

industry.

In small organisations, decision-makers find it difficult to express strategic processes when the level of analysis involves multiple actors, time delay effects, and different levels of interconnections between resources and their drivers (Nadkarni and Perez, 2007). If only one person is responsible for all strategic decisions in an organisation, his/her understanding of how the external and internal environments affect business performance is crucial in supporting his/her strategy process. In fact, managers of SMEs do not usually agree about strategic recommendations reported by external advisors because they have different mental models (Senge and Sterman, 1992). In order to support managers in strategic issues, researchers and practitioners should focus on sharing and improving managerial mental models (Senge, 2006). In SD there are two positions on the process of improving mental models: using simulators or modelling (Kunc, 2012).

SD scholars have used *simulators* (microworlds) for improving mental models, because microworlds can trigger changes in mental models by experiencing dynamic complexity (Morecroft, 2000). Simulators can give managers of SMEs new ways to think about causal relationships among relevant factors of strategic decisions. However, simulators reduce the complexity of a real situation in a structured model and, therefore, findings from these kind of studies cannot be extended to real business situations where the boundaries of decisions are not clearly established. On the other hand, *modelling* is considered as a tool for conceptual development of strategies (Gary et al., 2008). Through SD modelling, managers of SMEs can articulate strategic problems and initiatives and rehearse them using simulation. When decision-makers have the opportunity to develop a model, they are improving their mental models by understanding a strategic problem in terms of strategic resources and feedback processes involved in the strategy process (Morecroft, 2007; Kunc,

2012).

2.3 The Internationalisation Strategy

According to Wright, Westhead and Ucbasaran (2007), internationalisation research has focused on the process of increasing involvement in international markets, emerging two broad theoretical approaches: traditional internationalisation theory focused on factors affecting the internationalisation of large companies as a learning process (Andersson, 2004), and the international entrepreneurship theory focused on how companies from the outset try to discover and exploit opportunities (Zahra and George, 2002). At the early stage of firm internationalisation, scholars have discussed these two theoretical streams, for example, Andersson (2004:870) suggests that different theories are appropriate depending on the firm's stage of internationalisation and whether the industry is mature or growing. Firms at the early stage of internationalisation within a mature industry should be analysed using the learning process theory, but in growing industries the scope should be the international entrepreneurship theory. Although traditional internationalisation theory and international entrepreneurship theory have been analysed from two different scopes, both theories can be used for supporting findings that have emerged from the experience of applying OR/MS methods to support the internationalisation process of small companies.

Although, there are few OR/MS studies addressing particular issues of internationalisation, such as international investment (Trappey et al., 2007; Foster, 2000), or localisation (Fuchs and Kirchain, 2010), there is no evidence of how an OR/MS approach can facilitate the analysis of an internationalisation process. In order to support this analysis, this section will describe the most relevant internationalisation theories, the view of internationalisation strategy as a strategy process, and recent studies explaining SME internationalisation.

2.3.1 Internationalisation Theory

Probably the difficulties in establishing business in foreign markets are the main reason why large companies have traditionally explored international activities as part of their life cycle (Johanson and Vahlne, 1977; Birkinshaw et al., 1995). Typically, researchers who focus on analysing Multinational Enterprises (MNEs) have had two different streams: an economic vision or a process vision. Within the economic theories the Resource-Based View (RBV) (Barney, 1991) and Transactional Cost Economic (TCE) (Dunning, 1988) are invariably used by scholars for explaining internationalisation based on economic decisions. The RBV is one of the most widely accepted theoretical perspectives in management and its extensions to international business (Peng, 2001). Even though Penrose (1959) was one of the first researchers to connect the growth of a firm with the manner in which managers employ the internal resources, arguing that a firm consists of a collection of productive resources, the seminal work of Wernerfelt (1984) defined that a firm can earn better returns through the identification and acquisition of resources that are critical for developing demanded products. Seven years later, Barney (1991) enhancing this argument, linked the RBV with the competitive advantage of the firm (Porter, 2004) based on two assumptions: the resources are heterogeneously distributed among firms, and they are imperfectly mobile. He argued that if these resources are valuable, rare, and difficult to imitate (VRI), a firm would achieve a competitive advantage and a better performance in the short term (Newbert, 2007). In this view, resources are considered as the assets owned by the firm (Grant, 2008). In the last 20 years, the RBV framework has helped scholars to address a fundamental question in international business: ‘what determines the international success and failure of firms?’ (Rumelt, Schendel and Teece, 1994:564). The identification of international knowledge and experience as a valuable, unique, and hard-to-imitate resource has enabled the emergence of different approaches for explaining

the success of international companies and why other firms have not survived in a global competition (Peng, 2001). In contrast to the RBV theory, where managers' decisions are determined by its resources, TCE emphasises that boundary choices may be influenced by the efficiency of the chosen form of governance that minimise the costs of making transactions (Williamson, 1975). Bounded rationality and information asymmetry cause costs for making each contract as well as problems for negotiating them (Leiblein and Miller, 2003). According to Williamson (1985:55) asset specificity is defined as 'durable investments that are undertaken in support of particular transactions, the opportunity cost of which investments is much lower in best alternative uses or by alternatives users should the original transaction be prematurely terminated'.

Nonetheless, both classical economic approaches are often criticised for their static views of firms as having boundless resources or transactions with a lack of attention in the organisational learning. In contrast, the *process* vision is orientated to the understanding of the organisational learning process developed during the firm's internationalisation. This approach has focused on explaining factors and behaviours that guide the internationalisation process of the firm. Frequently, scholars identify in this stream the Uppsala Model as one of the most representative organisational model in international business. The Uppsala Model of internationalisation describes through four stages how the internationalisation process is made in a company. First, the model assumes that firms begin by serving the domestic market, then these firms look for penetrating foreign markets through their exports. After a while, outlets are established abroad for selling products, and finally, foreign production is set up (Johanson and Wiedersheim-Paul, 1975). Each level is related to the market experience available for making strategic decisions. In this sense this model suggests that firms start their international activities in those countries that are physically closer and there is a perception of better opportunities with less uncertainties (Johanson and

Vahlne, 1990). The physical distance of the markets was defined by Johanson and Vahlne (1977: 24) as ‘the sum of factors preventing the flow of information from and to the market. Examples are differences in language, education, business practices, culture, and industrial development’. These scholars suggest that evolutionary development of the internationalisation is based on a gradual acquisition, integration and use of knowledge about foreign markets (experiential learning) that determines greater levels of commitment to foreign markets. Although the Uppsala model was adopted by several researchers (Johanson and Vahlne, 2009), this model has been critiqued for the lack of logical consistency between the theoretical and operational levels (Andersen, 1993).

The perspective of physical distance can explain why a company chooses a specific country for its foreign activities. However, there is ambiguous evidence of whether the increasing knowledge is the reason for the firm’s internationalisation (Figueira-de Lemos, Johanson and Vahlne, 2011). Indeed, given that the nature of the Uppsala Model has not considered external factors affecting the internationalisation process, Johanson and Vahlne (1990) suggest analysing an international firm as a connected actor within a network. This new approach, called the *network model*, proposes that the market can be analysed as a set of networks among firms that allows them to obtain benefits from their interactions (Johanson and Vahlne, 1990). In international markets these relationships can enhance the internationalisation process of firms through networking and foreign experiential learning within the network. This avoids the stage process described by the Johanson and Vahlne (1977). In this model a firm depends on those firms with commercial agreements, and indirectly of their networking that affect the flow of interchange. The firm’s position is defined at two levels: the firm and the market. Both levels describe two element of the global industry network: (1) a network within local borders, and (2) a network of members within a specific product area (Johanson and Mattson, 1988). Andersson (2004) argues

that in later stages of the internationalisation process, the local network of which the foreign subsidiaries are a part become the most important sources of knowledge for the localisation of foreign activities.

2.3.2 Internationalisation as a Strategic Development Process

Internationalisation occurs through two mechanisms: trade and direct investment (Andersson, 2004). Both mechanisms are driven by exploiting market opportunities in other countries and locating production activities wherever firms can be run most efficiently (Grant, 2008). Traditionally, the internationalisation strategy has been employed by Multinational Enterprises (MNEs) to extend their activities in different countries (Melin, 1992). However, the growth of world trade has encouraged many Small and Medium-sized Enterprises (SMEs) also to internationalise their activities. Although the international business literature has described common internationalisation strategies employed by SMEs, such as joint ventures, alliances, or foreign direct investments (Escriba-Esteve et al., 2009; Bell, Crick and Young, 2004; Westhead, Wright and Ucbasaran, 2001), the understanding of how managers implement an internationalisation strategy is not clear. This process depends on the managers' perception of their own goals, generating heterogeneity even with similar resources (King, 2007). Furthermore, managerial mental representations in international SMEs, especially at earlier stages of internationalisation, may be affected by (1) the proliferation of potentially poor and damaging analysis as a consequence of less competent practitioners (Winch and Arthur, 2002), and (2) managerial experiences dominated by domestic mindsets – to use the same lens to evaluate the domestic and foreign environment (Nadkarni and Perez, 2007). These issues increase the complexity perceived by managers during the internationalisation process about relationships among resource-building actions, firm performance, and industry evolution (Kunc and Morecroft, 2010; Gavetti et al., 2005; King,

2007).

Welch and Luostarinen (1988) suggest that internationalisation is the process of increasing involvement in international operations across borders. Considering this definition, internationalisation can be defined as *the management processes used to inform, shape, and support strategic decisions related to where to compete and how to compete in new countries*. The internationalisation as a strategic development process should focus on the practice of improving strategic decision-making related to the internationalisation process. A strategic development process can be supported by the use of analytical models (Dyson, 2004) to determine the ongoing development and change in international firms in terms of scope, business idea, action orientation, organising principles, nature of managerial work, dominating values, and converging norms (Melin, 1992). During the process of planning and developing the internationalisation, managers acquire specific knowledge and competences that are imperfectly imitable by would-be rival firms (Knight and Kim, 2009). Competitors might well be able to imitate the visible, tangible resources owned by the smaller firm (e.g., plant, equipment, raw materials), but it is more difficult to imitate idiosyncratic knowledge-intensive processes that give rise to superior international business competences. Competitive imitation of such resources is possible only via the same time-consuming process of irreversible investment or knowledge acquisition that the firm itself developed (Collis, 1991).

All of these aspects of internationalisation enhance the growth rates, especially in those economies based on natural resource-based activities (Leonidou et al., 2007). Positive effects are caused by increasing the capabilities of managers to deal with market dynamics and potential business opportunities. The rise in profits generates new and stable employment, an increase in the gross domestic product (GDP), competitive domestic prices in

goods and services, and new opportunities for starting new ventures (Wright et al., 2007). Nowadays, these reasons stimulate countries to develop public policies and international trade agreements for supporting the firm’s internationalisation activities. However, this task must be carried on carefully because the propensity to expand the activities internationally is counterbalanced by risks related to less information about foreign markets (i.e. social, cultural, and economic information); the lack of international managerial capabilities and financial resources; difficulties for understanding the needs of foreign customers and competitors; and the fluctuation in the exchange rate (Brouthers et al., 2009).

2.3.3 Internationalisation in SMEs: a RBV perspective

Small companies that after a short period of their inception have developed international activities in spite of their limited resources, they have modified the traditional scope about the internationalisation process (Oviatt and McDougall, 1994). According to Knight and Kim (2009) these kind of international SME tend not to fit the profile of MNEs who have substantial financial and tangible resources because SMEs tend to possess far fewer tangible assets, such as plant, property, and equipment, as well as financial and human resources; those are usually factors that allow the internationalisation of large firms. For SMEs, internationalisation is an innovative act (Knight and Cavusgil, 2004) that is perceived as a complex process for the number of factors, decisions, and cultural differences when dealing with international operations (Oviatt and McDougall, 2005). The RBV perspective argues that a firm has superior performance over rivals when it is able to develop unique organisational resources (Barney, 1991) and align these with environmental opportunities and threats (Danis, Chiaburu and Lyles, 2010). Although the RBV approach has advantages in explaining performance heterogeneity within the same industry in terms of unique, valuable, inimitable resources, it is weak linking with the analysis of how strategy processes

are developed by managers. This weakness is supplemented by the dynamic capabilities perspective that recognises the importance of the superior ability of certain firms to create critical competences embedded in their routines (Knight and Kim, 2009). However, such development of capabilities is a dynamic process by which managers alter their resource configurations to achieve strategic fit with an often-changing environment (Eisenhardt and Martin, 2000). Hence, fundamental changes in business philosophy and orientation are required to succeed in an international, as opposed to a domestic marketplace (Knight and Cavusgil, 2004).

These organisational changes required to a successful internationalisation trigger a relevant question: why do SMEs become global? Regarding this question, Qian and Li (2003) suggest that SMEs can benefit from internationalisation in four ways. First, SMEs with substantial research and development investments can take advantage of a greater volume of products which might be sold across many markets. But difficulties in valuing resources can lead to market failure for resource exchange, especially for capabilities in an international context (Knight and Kim, 2009). As an alternative, firms can focus on alliances as an external mechanism for improving these exchanges (Wiklund and Shepherd, 2009). Second, internationalisation increases economies of scale which promote experience effects in production. The experiences, skills, and capabilities of an entrepreneur/owner and top management team are generally regarded as key factors influencing business survival, development, and the propensity for their business to be an exporter (Westhead, Wright and Ucbasaran, 2001). Nonetheless, better performance also depends on firms making complementary human capital investments, encouraging key employees to absorb and apply firm-specific knowledge, even though this new knowledge generated might induce concerns among the employees about economic appropriation (Wang, He and Mahoney, 2009). Third, internationalisation generates extra profits to sustain large-scale innovation oper-

ations. A firm's technological ability facilitates the creation of better products and the improvement of existing ones, as well as greater effectiveness and efficiency in production processes (Knight and Cavusgil, 2004). Furthermore, many international companies leverage information and communications technologies to interact more efficiently with customers and suppliers, and understand the needs of new market niches worldwide (Zahra et al., 2000). Fourth, SMEs have to maximise sales as soon as possible before the products are made obsolete. Nowadays the global market combined with advancing information and communications technologies (ICT), such as internet and mobile applications, is contributing to growing sales in international business for the small and medium enterprise (Knight and Kim, 2009). An additional benefit that SMEs may leverage from internationalisation is the use of international standards as a measure of formality, reliability, and quality for partners in foreign markets (Kumar and Antony, 2008).

During recent years an increasing number of well-documented researches focusing on analysing the SME internationalisation process have emerged. Although there are still few articles comparing the phenomenon of MNEs, the relevance of this new field has emerged as a key topic in leading international business journals (Oviatt and McDougall, 2005). Among the journals, I have examined the *Journal of International Business Studies (JIBS)*, *Strategic Management Journal (SMJ)*, *Academy of Management Journal (AMJ)*, *Entrepreneurship Theory and Practice (ETP)*, and *Journal of Business Venturing (JBV)*. All of which have been found in leading forums (Oviatt and McDougall, 1994; Peng, 2001; Newbert, 2007). I have also included other relevant journals as *Academy of Management Review (AMR)*, *Journal of Management (JoM)*, *Journal of Management Studies (JMS)*, and *Organisational Science (OS)*, but it was not possible to find articles related to this area within these mainstream management outlets. Table 2.3 summarises the 15 articles that were found exploring the internationalisation of small companies.

Table 2.3: Some relevant studies about the SME internationalisation process

Year	Article	Business Sector	Sample	Economy Status
2010	Khavul et al. (JBV)	Software, pharmaceuticals, manufacturing, and service firms	166 SMEs	Developing Economies
	Terziovski (SMJ)	Manufacturing sector	600 SMEs	Developed Economies
	Danis et al. (JIBS)	Unspecified	335 SMEs	Developing Economies
2009	Knight and Kim (JIBS)	Technology sector	98 SMEs	Developed Economies
	Filatovchev et al. (JIBS)	Technology sector	711 SMEs	Developing Economies
	Lechner and Leyronas (ETP)	Consulting and food sectors	3 SMEs	Developed Economies
	Terjesen and Elam (ETP)	Capital funds and fish and mineral sectors	5 SMEs	Developed Economies
	Wiklund and Shepherd (ETP)	Manufacturing, professional services, retail, and other services	319 SMEs	Developed Economies
2008	Doving and Gooderham (SMJ)	Accountancy industry	254 SMEs	Developed Economies
2005	Steensma et al. (AMJ)	Chemicals, electronics, construction, machinery, food processing, textiles, and computers/software industries	241 SMEs	Developing Economies
2004	(Knight and Cavusgil, 2004) (JIBS)	Manufacturing firms	203 SMEs	Developed Economies
	Crick (JBV)	Clothing Industry	24 SMEs	Developed Economies
2003	Qian and Li (SMJ)	High-tech industries	67 SMEs	Unspecified
2001	Lu and Beamish (SMJ)	Unspecified	164 SMEs	Developed Economies
	Westhead et al. (JBV)	Manufacturing and service-sector	116 SMEs	Developed Economies

Empirical literature of international small business studies has primarily focused its attention on discussing and exploring the effects of internationalisation on firm performance within developed economies (Lu and Beamish, 2001). For example, Terziovski (2010) identifies innovation drivers and their performance implications in manufacturing SMEs. Using a survey data from a sample of 600 Australian SMEs, he found that SMEs are similar to large firms with respect to the way that innovation strategy and formal structure are the key drivers of their performance, but they do not appear to utilise innovation culture in a strategic and structured manner. This study concludes that the performance of SMEs is likely to improve as they increase the degree to which they mirror large manufacturing firms with respect to formal strategy and structure, and to which they recognise that innovation culture and strategy are closely aligned throughout the innovation process. This

innovation can be reached by developing alliances in the foreign market or through acquiring knowledge and technology directly from rivals (Wiklund and Shepherd, 2009). A second stream is related to those studies about born-global firms that from their start-up are focused on international markets. Knight and Cavusgil (2004) investigated the phenomenon of early internationalisation and highlighted the importance of several key organisational capabilities that engender international success in born-globals such as, entrepreneurial orientation, and marketing orientation. Most of these born-global firms use knowledge intensively to develop their business activities (Autio et al., 2000) – This group of firm are also called knowledge intensive firms (KIF) in the literature of international businesses (Von Nordenflycht, 2010). Although most of these studies analyse individual entrepreneurial firms, Lechner and Leyronas (2009) investigated small and young business groups organised in a holding structure. They argue that the small business group is both the outcome and the antecedent of growth. When entrepreneurial firms are organised as a group, they attract complementary resources that facilitate the exploitation of new opportunities, thereby overcoming overembeddedness, and dealing with competition (concurrent cooperative and competitive relationships with another company). Market opportunities are a strong reason why entrepreneurs should explore and pursue international activities. However, distinctive worldviews (as an approximation of habitus) guide the way in which the internationalisation is developed, such as: alliances, FDI, exports, and joint venture (Terjesen and Elam, 2009).

On the other hand, several scholars have also paid attention to the internationalisation of SMEs located within developing countries. For example, Danis et al. (2010) examine the relationship between institutional change and firm strategy in the context of transition economies. Particularly, this article shows how the competitive strategies of SMEs evolve during institutional transitions, and assesses the implications for firm growth. Using data

collected from 135 SMEs in 1993, and 200 SMEs in 2001, Danis et al. (2010) find that managerial networking intensity (i.e., developing and maintaining relationships that may be used for business purposes) declines markedly over time, whereas the importance of market-based strategies increases. A relevant insight into this work is that changes in strategy are concurrently driven by socially constructed norms that legitimise new ways of competing and delegitimise old ones, and by knowledge acquisition and learning, which provide managers with a more diverse set of tools with which to exercise their strategic choices. In developing economies the orientation of the owners and managers plays a central role in the success of international strategy. Filatotchev et al. (2009) argue that export orientation and performance depend not only on the development of capabilities through R&D and technology transfer, but also on entrepreneurial characteristics, such as the founder's international background and global networks. Another interesting study was developed by Khavul et al. (2010), who suggest that when international SMEs have a closer relationships with their most important international customers, they can implement their strategic goals in international markets more effectively. Under a resource-based view approach, scholars emphasise the role of resources and capabilities in SMEs orientated to international markets. Table 2.4 shows the resources and capabilities tested in previous studies supporting the SME internationalisation processes. This review suggests a great deal of variation in the resources and capabilities supporting the SME internationalisation processes. Indeed, only one of the eight resources (social capital) and three of the 20 capabilities (product development, international orientation, and marketing expertise) are examined in more than 20 per cent of the articles. Even though these studies have explored different industrial sectors, findings are limited to a descriptive analysis of characteristics of the firm with little attention on the role played by CEOs in the SME internationalisation.

Table 2.4: Review of resources and capabilities supporting the SME internationalisation

Resources and Capabilities (*)	Industrial Sector		Country Status			
	KIF	Traditional Manufacturing	Developed Countries	Developing Countries	(#) Articles (**)	(%) Total Articles
<i>Resources</i>						
Business localisation	✓		✓		1	5
Communication systems	✓		✓		1	5
Business size	✓		✓	✓	1	5
Financial resources	✓		✓		1	5
Innovation	✓		✓		1	5
Market knowledge	—	—	—	—	1	5
Proprietary technology	✓			✓	1	5
TMT size		✓	✓		1	5
Social capital	✓	✓	✓		4	20
International standards		✓		✓	1	5
<i>Capabilities</i>						
Entrepreneurial orientation	✓		✓		2	10
Heterogeneity of human capital	✓		✓		1	5
International innovativeness	✓		✓		1	5
International orientation	✓		✓		3	15
Knowledge acquisition	—	—	—	—	1	5

Continued on Next Page...

Table 2.4 – Continued

Learning orientation	–	–	–	–	2	10
TMT's experience	✓		✓	✓	3	15
Market orientation	✓		✓		3	15
Marketing expertise	✓		✓	✓	4	20
Owner's experience	✓	✓	✓		4	20
Process development	✓		✓		1	5
Product development	✓	✓	✓	✓	5	25
Service development	✓		✓		1	5
Technology development	✓		✓		1	5
Technological expertise	✓		✓	✓	3	15
Research and development			✓		1	5
Training	✓			✓	1	5

(*)The selection filters used herein are based on and adapted from those developed by Newbert (2007)

(**)Total number of studies : 22

(–) : Unspecified

2.3.4 The CEO in the SME internationalisation

In recent years, a significant volume of research has focused on the active role played by Chief Executive Officers (CEOs) of small and medium-sized enterprises (SMEs) in orientating to international markets (Finkelstein and Hambrick, 1990; Knockaert et al., 2011; Gielnik, Zacher and Frese, 2012; Westhead et al., 2001). Most of these CEOs use knowledge intensively as the basis of their competitive advantage in industries whose products and production functions rely on a substantial body of complex knowledge (Filatotchev and Piesse, 2009). However, in developing countries most firms only have access to natural resource-based products, such as fruit producers and fishing firms, as a route to access international markets (Khavul et al., 2010). Even though these firms are sometimes created directly to satisfy the needs of international markets, often their products and resources do not seem particularly unique (Knight and Cavusgil, 2004) in giving them a competitive advantage over competitors in their target markets.

In many small firms, CEOs are the key resource. They can accumulate human capital and social capital, leading to industry and management know-how, in both domestic and international markets (Brush, Edelman and Manolova, 2002). According to Filatotchev et al. (2009), experiences may shape the lens-like cognitive structures through which managers see the world, and these cognitive structures (or mental models) enable entrepreneurs both to filter business opportunities and to interpret and construct meanings out of them; to cope with rapidly changing external environments; and to make appropriate strategic responses. In the context of internationalisation, the role of the CEO's knowledge and experience has been examined by three main theoretical streams: the processes of acquiring knowledge in international markets (Lu and Beamish, 2006); trial and error of implementing entry modes (Autio et al., 2000; Crick, Chaudhry and Batstone, 2001); and knowledge

transfer in cross-border activities (Knockaert et al., 2011). The repeated exposure to uncertainty associated with the process of internationalisation compels CEOs to expand both their set of organisational processes and their awareness of the cause/effect relationships among these processes (Filatotchev et al., 2009). The entrepreneurs' superior human capital guide SMEs in detecting and exploiting opportunities abroad, that essentially is the base of the small firm's strategy (Lechner and Leyronas, 2009). In strategic management arenas, this process of detecting and exploiting opportunities is called *dynamic capability*. The value of dynamic capabilities lies in the resource configurations that they create or enhance, which enable the firm to pursue opportunities in new, unpredictable markets (Doving and Gooderham, 2008).

On the other hand, failure in the internationalisation of the firm may be attributed to some CEO's characteristics, such as lack of experience and education, and limited network (Crick, 2004). According to Carayannopoulos (2009:421), small firms 'are often encouraged or even forced to market their products in small niches, in part to avoid competition, and in part due to their limited resources'. The small size of the firm and limited time it has had to establish relationships with customers limit both its experience of developing international activities and of drawing the number of established and loyal customers. Nonetheless, these characteristics may also be potentially sources of advantage for young firms. For example, Autio et al. (2000) found that the lack of ingrained routines and mindsets due to age and experience can allow young firms to explore and learn faster opportunities in new markets than MNEs. Also, the greater flexibility of the organisational structure increases the firm's performance in volatile environments (Keupp and Gassmann, 2009). These characteristics may represent assets of youthfulness that stakeholders may value and are willing to support (Shepherd, 2009). However, in practice, this is very difficult, and often, SMEs only have access to funds available from founders, family, friends, or others who are willing to lend

money or invest in these firms Carayannopoulos (2009).

2.3.5 CEOs in the SME Internationalisation from developing countries

If significant national competitive advantage based on natural resources – an external view of competitive advantage – is the main explanation of the internationalisation processes of SMEs in developing countries (McDougall and Oviatt, 2000), there would be a large number of SMEs competing successfully in global markets. However, this is neither the case nor the common performance of SMEs (Westhead et al., 2001). The RBV theory offers two supplementing explanations about the performance of SMEs in terms of internationalisation processes. The first explanation suggests that local market characteristics can stimulate CEOs to export intensively. Examples of these stimuli are the availability of natural resources (commodities), the underdeveloped production of high-technology products, the low technical knowledge required for production, the existence of Free Trade Agreements (FTA) and the lack of a qualified workforce (Leonidou et al., 2007). The second explanation is that internationalisation activities may be partially explained by internal resources and managerial background characteristics (Knockaert et al., 2011). In this approach, researchers argue that the identification of international knowledge and experience is one of the key drivers of internationalisation (Peng, 2001). The existence of CEOs with dynamic capabilities, such as strategic and learning orientation, is suggested as one of the main factors in explaining heterogeneity in the international performance of firms (Knight and Kim, 2009).

The origin of these capabilities has generated a broad debate about whether or not these capabilities are either a consequence of managerial experiences or are developed by formal training (Shamsie et al., 2009; Terjesen and Elam, 2009). According to King and Tucci (2002), market experience increases the probability that a firm would enter a new market.

In fact, Escriba-Esteve et al. (2009) applied King and Tucci's (2002) argument to international SMEs from mature industries located within developed countries. By contrast, Acedo and Jones (2007) show that international orientation of small business managers can be observed from the individual demographic characteristics that include formal education. Fernandez-Ortiz and Lombardo (2009) suggest that educated managers can formulate consistent strategic objectives, and develop positive attitudes towards risk in international markets. Even though Hambrick and Fukutomi (1991) suggest that the managers' tangible abilities are derived from both business experience and formal education, the impact on exports is not conclusive when small firms are located within markets with an under-developed production of high-technology products and low technical knowledge required for production. This is the case of commodity firms in Chile – and most developing countries. I theorise four hypotheses which investigate whether business education and formal education of CEOs – the sources of dynamic capabilities – affect the internationalisation of SMEs in a developing country.

CEO tenure

Tenure results in managerial experience that builds valuable knowledge and practice for the firm (Nelson, 2003). Tenure allows the development of information sources and problem-solving routines (Katz, 1982). In SMEs, CEOs can lead their organisations when they possess technical knowledge and managerial experience for developing business activities across target markets (Doving and Gooderham, 2008). Firms who have CEOs able to make faster strategic decisions can exploit opportunities across a wide range of environmental contexts (Baum and Wally, 2003). However, there is evidence that firms led by long-tenure executives tend to have persistent and unchanging strategies (Finkelstein and Hambrick, 1990). Hence, long tenure can influence the adoption of less riskier strategies

related to internationalisation. In SMEs, long-term CEOs tend to develop a particular repertoire of responses to environmental and organisational stimuli that frequently acts against any change in policy (Miller et al., 1998). Although their skills can be considered as relevant for the firm's current configuration, as long-term CEOs they have more firm-specific knowledge than general human capital (Finkelstein and Hambrick, 1990). Finkelstein and Hambrick (1990) also suggest that tenure tends to restrict information processing. Over time, CEOs develop habits that rely on past experience rather than new stimuli (Katz, 1982). This fact leads to an increased strength in the CEO's dominant logic (mental model) of using only the information source perceived by him/her as relevant for strategic choices (Nelson, 2003). Therefore:

*Hypothesis 1: The CEO tenure is negatively related to the export intensity of SMEs
located within a developing country*

CEO education

Westhead et al. (2001) suggest that decisions by many small and micro firms to internationalise are generally based on aspirations, skills, resources, and competencies of entrepreneurs. Although, McKelvie and Davidsson (2009) argue that CEOs with greater human capital (e.g., competencies, knowledge, and skills) start multiple ventures in response to their aspirations, those competencies developed by formal training may help firms to pursue new opportunities in foreign markets. Firstly, educated individuals are more likely to develop business plans (Richbell et al., 2006), which are useful for implementing an internationalisation strategy (Knight and Cavusgil, 2004). However, in developing countries this last argument is not clear because SMEs develop many informal processes for implementing strategies (Terziovski, 2010). Secondly, knowledge acquired as a consequence of formal training can guide CEOs to make better analyses of potential opportunities abroad

(Fernandez-Ortiz and Lombardo, 2009). Firms located within developing countries have to create superior offerings compared to their local markets to enhance customer satisfaction and generate differentiation benefits, thus leading to increased foreign customer loyalty (Knight and Cavusgil, 2004). Finally, Crick (2004) suggests that the decision of some firms to discontinue exporting is influenced by critical incidents, especially in relation to untrained export staff. CEOs with a formal degree in business may be better able to search for new exporting opportunities than CEOs without such educational qualifications. Therefore:

Hypothesis 2: The level of academic achievement of CEOs is positively related to the export intensity of SMEs located within a developing country

Hypothesis 3: The CEO with an academic degree in business is positively related to the export intensity of SMEs located within a developing country

CEO age

In the literature about small businesses, there is no conclusive evidence about the relationship between the age of CEOs and the level of export intensity of the firm. Ursic and Czinkota (1989) suggest that the manager age affects export propensity and intensity of the firm. CEOs who hold authority and responsibility for high-level decision-making can affect significantly on the firm's international affairs (Nelson, 2003). Furthermore, international SMEs need large investment for producing and exporting products to international markets. This investment also depends on CEOs' borrowing capacity. However, Romano, Tanewski and Smyrnios (2001) suggest that older CEOs tend to be less willing to invest additional finances into their firms because they use less debt and are more reluctant than younger entrepreneurs to accept outside participation. On the other hand, age is highly

related to those skills acquired by CEOs during previous managerial experience (Westhead et al., 2001). Nonetheless, empirical evidence suggests that CEO age is negatively related to venture growth because they are more conservative, and show less physical and mental persistence to achieve new challenges (Gielnik et al., 2012). Therefore:

Hypothesis 4: The CEO age is negatively related to the export intensity of SMEs located within a developing country

2.4 Summarising Relevant Ideas of Chapter 2

The strategic development process provides a framework which allows for the support of different activities of strategy processes (Dyson et al., 2007) (e.g., direction, creation, rehearsal, implementation, and choice). The analysis of the SME internationalisation as a strategic development process provides small companies with several tools to improve the CEO's reflective engagement and analytical reasoning of the internationalisation process. SD modelling is a tool to support deliberate aspects of strategy rehearsal in organisations, such as the management of the firm's internal resources and capabilities, but it is also able to cater for the emergent (e.g. the creation and assessment of strategic initiatives based on the firm-specific resource stocks). Although strategy rehearsal is one of the five activities within the strategic development process, its potential impact on supporting the internationalisation of small organisations by using SD modelling is the reason of why this doctoral thesis focusses on the rehearsal activity (Figure 2.2). There are alternative approaches to rehearsing strategy, such as agent-based models, profit impact of market strategy, and balanced scorecard (Dyson et al., 2007). However, SD modelling offers a dynamic tool to develop corrective actions from real-world feedback with virtual feedback to improve strategic foresight about the firm-specific resource stocks (Kunc and Morecroft, 2007a).

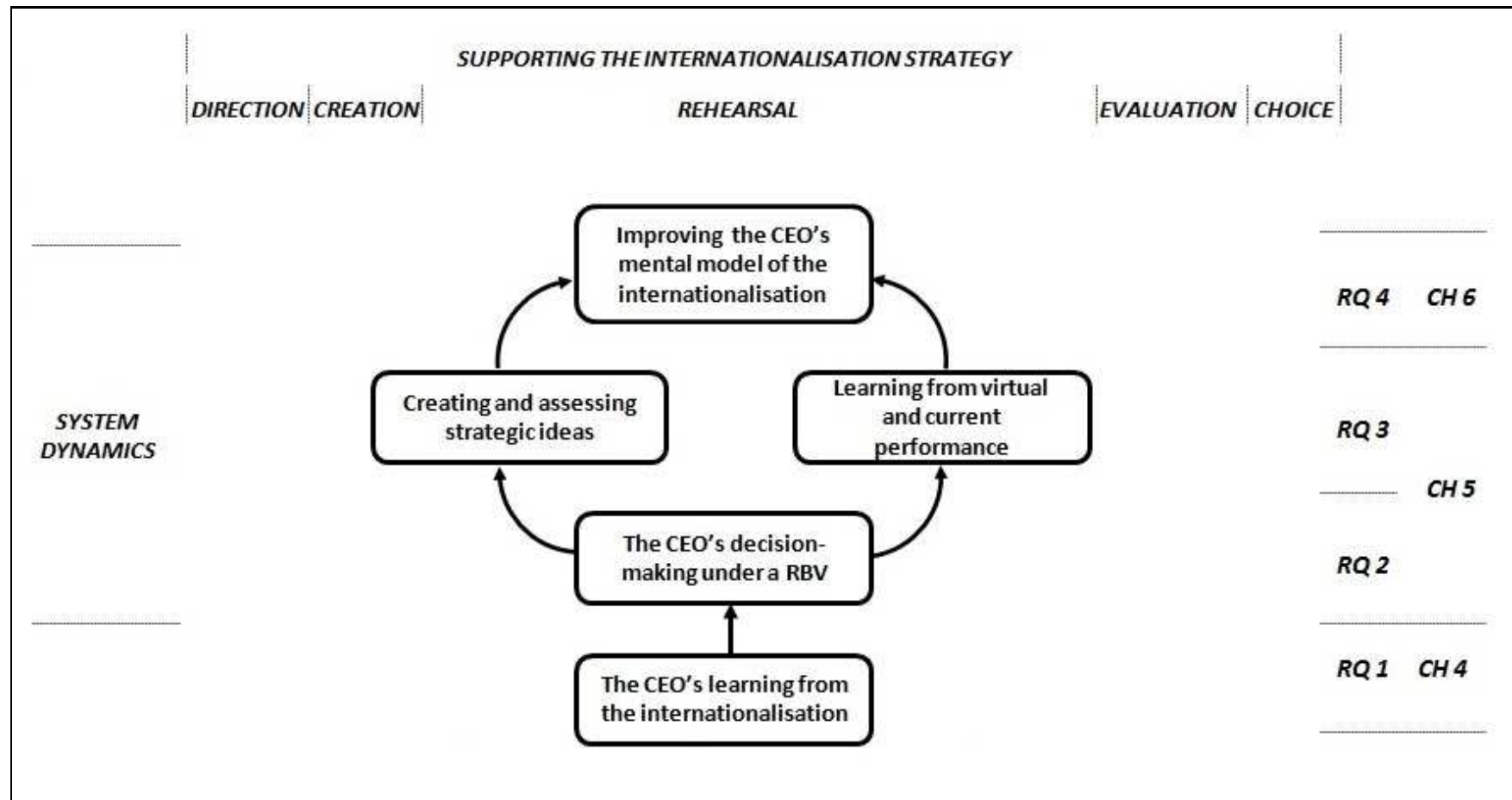


Figure 2.2: Research Framework

Under a Resource-Based View, theories of why small firms internationalise their activities fall into two broad streams. The first group of theories explains that national competitive advantages are the main explanation of the internationalisation processes of SMEs (McDougall and Oviatt, 2000). These national advantages involve the abundance of natural resources (commodities), the availability of highly technical knowledge required for production (e.g., people and technology), and low barriers for trade, such as free trade agreements. On the other hand, the internationalisation activities may be partially explained by the decision-making process – the management of the firm’s internal resources and managerial capabilities (Knockaert et al., 2011). Here, CEOs play a relevant role in explaining heterogeneity in the international performance of firms (Knight and Kim, 2009), because they are responsible for developing the process of investing in strategic resources to implement strategies. SD modelling shares some theoretical assumptions of the Resource-Based View in strategy (Gary et al., 2008). Both approaches emphasises the relevance of tangible and intangible firm-specific resource stocks, the process of the firm’s resource accumulation, and the bounded rationality of managers (Penrose, 1959; Dierickx and Cool, 1989; Forrester, 1961; Sterman, 1989).

The doctoral thesis attempts to support the internationalisation of a particular group of companies which are located within a developing country with an underdeveloped production of high-technology products and low technical knowledge required for production. In this context, there is inconclusive evidence of the impact of the CEO’s learning on the internationalisation (RQ 1: *What is the impact of the CEO’s learning on the internationalisation processes of SMEs located within a developing country?*). A positive impact of CEO’s learning can provide this doctoral research with robust evidence whether the use of analytical reasoning supported by SD modelling can improve the CEO’s mental models of the internationalisation. The analysis of these *mental models* is fundamental for reflect-

ing about how an organisation can develop an internationalisation strategy differently – the essence of strategy (Grant, 2008) (RQ 2: *How do CEOs of small firms manage their resources for implementing an internationalisation strategy?*).

Mental models can be simple generalisations, such as *small firms located within developing countries have informal export procedures*, or they can be theories, such as *how CEOs of small organisations develop internationalisation processes* (Senge, 2006). Several studies on the theory of bounded rationality and mental model suggest that it is difficult to understand the objective environment because this is an outcome of interaction between organisations (Smircich and Stubbart, 1985). The environment is therefore a dynamic process rather than a static representation (Bourgeois, 1984). For that reason, researchers should not focus on the objective analysis of the environment (Mason and Mitroff, 1981), but rather on analysing managers themselves to support their sense-making of both their organisation and the environment (Smircich and Stubbart, 1985). Although real-world actions and decisions are not available until implementation is well underway (Dyson et al., 2007), the learning from the process of depicting the CEO’s mental models can encourage them to discuss the future of the organisations. Research Question 3 (*How can SD modelling support the internationalisation strategy of small firms in practice?*) explores whether the creation and use of SD models of the firm’s resource system can provide CEOs of small organisations with a space to explore future performance as well as test and evaluate alternative strategic initiatives. Kunc and Morecroft (2010) suggest that managers perceive the resource system available in their companies differently. Therefore, they can develop different strategies using similar resources. However, little evidence of Kunc and Morecroft’s suggestion (2010) has been found in the literature of small business. In fact, the traditional RBV argument suggests that international low-manufacturing SMEs develop similar strategies when they possess similar resources (Khavul et al., 2010). This

gap in the literature encourages the formulation of Research Question 4: *Are the CEO's mental models of the same internationalisation strategy similar in those firms with similar resources?*.

Chapter 3

Methodology

3.1 Introduction

Chapter 3 discusses the research design, data collection, and data analysis procedures of the doctoral research. The development of the doctoral research is divided into two strategies of inquiry: (1) an econometric analysis and (2) case study research. The econometric analysis attempts to answer Research Question 1: *What is the impact of the CEOs on the internationalisation processes of SMEs located within a developing country?* by performing a multiple regression modelling. In particular, the use of multiple regression modelling provides strong evidence in supporting causal relationships between the CEO's characteristics and the internationalisation process of small organisations.

The case study research addresses research questions 2, 3 and 4: *How do CEOs of small firms manage their resources for implementing an internationalisation strategy?*; *How can SD modelling support the internationalisation strategy of small firms in practice?* and *Are the CEO's mental models of the same internationalisation strategy similar in those firms with similar resources?*. I conducted a facilitated SD modelling process in five small organisations to support their internationalisation process. Although the researcher has a passive

observing/data collecting role in a traditional case study research, the approach followed by this doctoral research emphasises the active role played by the research to facilitate two activities of the strategy rehearsal: creating and assessing strategic initiatives, and learning from virtual and current performance (Dyson et al., 2007). The facilitated modelling process helps the CEOs to build their SD models of the resource system available to implement the internationalisation. The SD models show how the CEOs of small organisations manage their resources for implementing an internationalisation strategy (Research Question 2). Modelling the resource system in these organisations provides insights into how to support them by improving their understanding of the internationalisation process as well as learning from strategy rehearsal prior to implementation (Research Question 3). Finally, the cross-case analysis allows the comparison of the SD models developed by CEOs and suggests a potential source of performance heterogeneity (Research Question 4). The five organisations selected are led by similar CEOs, have similar resources, are located within the same geographic area, and implement the same internationalisation strategy which is direct exports. These factors enable findings to be compared across cases and extend those that have emerged from the econometric analysis.

3.2 Inquiry 1. Econometric Analysis

An econometric analysis provides a quantitative or numeric description of trends, attitudes, or opinions of a population by studying a sample of that population (Creswell, 2009). Although there are mainly two sources of data in quantitative studies, *surveys* and *experiments*, data provided from *surveys* is appropriated in an uncontrolled situation by asking questions or making observations (Hussey and Hussey, 1997). The econometric analysis has been developed into five steps. First, an in-depth literature review allows the development of the relevant hypothesis. Chapter 2 formulates four hypotheses related to the role of

the CEOs on the firm's internationalisation. Second, the sources of data are selected. By using a survey provided by the Chilean National Institute of Statistics (*Instituto Nacional de Estadística de Chile*), I gathered data for testing four hypotheses. Third, the method for validating the hypotheses is selected. I chose a multiple regression model based on econometric criteria such as: sample size, robustness of results, and the use in previous international business studies. Fourth, the constructs and models for each hypothesis were developed. Here, I used constructs defined by previous studies relating to the internationalisation of small business. I built three models to validate the hypotheses. Finally, econometric problems related to the selected method were assessed. For all models, I analysed problems of multicollinearity and autocorrelation.

The remainder of Section 3.2 *Econometric Analysis* is divided into three subsections. First, the selection of the database is presented. Then, the description of the multi regression modelling for testing hypotheses of the econometric analysis is shown. Finally, the constructs which measure the variables of analysis in Chapter 4 – *Influences of CEOs during the Internationalisation of SMEs* – are defined.

3.2.1 Selecting the Database

There are several sources of databases about business, such as Datastream and Bloomberg. Although these databases have interesting information about small organisations, they have insufficient data about the particular characteristics of CEOs of small firms located within developing countries. In Latin America, several countries, such as Chile, Brazil, Mexico, Argentina and Colombia run surveys of SMEs annually. In Chile, the Chilean National Institute of Statistics performs an annual survey of SMEs, the National Business Survey, in different industrial sectors using a stratified sampling approach. From this survey, I have intentionally selected 921 small companies which export commodities, such as lumber, fish,

fruit, and wine. Data collected from the survey describes the firm's characteristics such as, turnover, employees, localisation, communication systems, capital, and alliances, as well as information from the CEO's characteristics such as, education, tenure, age, and background. These 921 firms have less than 200 employees and an annual turnover up to £2.8 million. This is an acceptable norm for studies from emerging markets that have also considered Chilean companies (Aulakh, Kotabe and Teegen, 2000). I have excluded the mining industry because in this sector products and production functions are highly technological, and the purpose of the doctoral thesis is to explore and support those export SMEs which are not characterised by knowledge intensity. This group of firms represents most of the 70 per cent of the international SMEs in Chile¹.

Many studies on international ventures in emerging economies have focused on countries with liberalisation processes because these economies have many potential opportunities for the internationalisation of SMEs (Khavul et al., 2010; Luo and Tung, 2007; Aulakh et al., 2000) but this does not imply that SMEs will become exporters automatically. Countries with liberalisation processes that benefit exports of commodities, such as Free Trade Agreements, provide quasi-experimental settings (Toulan, 2002) to test for firm effects on internationalisation processes. Chile has been implementing aggressive liberalisation processes for the last two decades 1990 and 2010, as is demonstrated by its signing the Free Trade Agreements (FTAs) with the United States of America, the European Union, China, Japan, South Korea, Canada, and Mexico (Siliverstovs and Herzer, 2007). These agreements have opened huge markets for its commodities for more than 10 years, thus providing enough time for SMEs to develop their capabilities and resources and to become international players.

¹Information provided by the Chilean National Institute of Statistics in the annual survey of SMEs (2006).

In Chile, as well as in many developing countries, standards divide business size according to annual turnover. The Chilean National Institute of Statistics uses a formal unit called CPI-Indexed Unit of Account (U.F.) to determine the annual turnover ceiling². The annual turnover ceiling for medium-sized business have been established between 1.1 – 2.3 million pounds and for small companies, ceilings are considered from 0.6 – 1.1 million pounds. These ceilings are lower than North American or European ranges, but proportional to the size of the economy. For example, in 1995 the European Union defined that small companies as those with up to 50 employees, and medium companies as those with 51 and 250 employees (Hadjimanolis, 2000). Nowadays, new standards were given in 2003 by the European Commission that also consider an annual turnover ceiling from 8 million pounds to 40 million pounds (medium-sized enterprises) and from 1.6 million pounds to 8 million pounds (small-sized enterprises). Another criterion adopted by the European Commission was to establish a ceiling based on the annual balance sheet for SMEs. The US Small Business Administration defines a SMEs as one with less than 500 employees (Prashantham and Berry, 2004).

3.2.2 Selecting the Method for testing hypotheses

During the last two decades, the internationalisation process has long been a central topic in many SME studies. There have been essentially two methods used to validate hypotheses about export performance factors. They are based on *multiple regression modelling* (Khavul et al., 2010; Terziovski, 2010; Brouthers et al., 2009), and *structural equation modelling* (SEM) (Acedo and Jones, 2007; Diamantopoulos, 1999). Both methods are validation instruments that help to examine theory and measures (Hulland, 1999). I selected

²CPI-Indexed Unit of Account (U.F.) is a monetary unit mainly used in business and formal financial transaction in Chile, and the rate of the U.F. varies daily according to the monthly inflation rate (Shiller, R. J. 1998. 'Indexed Units of Account: Theory and Assessment of Historical Experience'. NBER Working Paper No. W6356. Available at SSRN: <http://ssrn.com/abstract=84108>).

multiple regression modelling because it is a robust method for testing hypotheses with predictable variables, and many of the considerations about when it is justified to use SEM do not apply for the sample selected. For example, Acedo and Jones (2007:242) recommend using SEM ‘where theory is insufficiently grounded and the variables or measurements do not conform to a rigorously specified measurement model’. Several studies have discussed the role of managerial characteristics and have explained the difference in performance among small firms (Fernandez-Ortiz and Lombardo, 2009). My intention is to explore in depth how CEO’s characteristics affect the performance of international SMEs. On the other hand, Ainuddin et al. (2007:56) comment that use of ‘SEM is especially suited to exploratory studies where [...] (relationships) have not been previously tested’. Even though, there is no previous evidence of testing whether the CEO’s background, and the level and diversity of resources are the drivers of performance heterogeneity among international SMEs located within developing countries, I used the same index of similar studies of internationalisation for testing the hypotheses. Another criterion has been introduced by Birkinshaw et al. (1995:646-647), ‘SEM is most appropriate when sample sizes are small’. When a sample size is small, some assumptions of multivariate normality and interval scaled data cannot be made. Nonetheless, the information of 921 SMEs is a range considered as a large sample.

Multiple regression uses two or more predictors of the dependent variable Y . The general equation for obtained the predicted value (\hat{Y}) is:

$$\hat{Y} = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \dots + \beta_k X_k \quad (3.1)$$

The equation 3.1 reproduces the observed Y scores obtained as this predicted value plus an error term (e) unique to each individual.

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \dots + \beta_k X_k + e \quad (3.2)$$

It is possible to obtain the predicted Y score for any individual by taking that individual's scores on X_1 to X_k , multiplying these by corresponding constants β_1 to β_k , and summing these products together with the constant α (Gelman and Hill, 2007).

Gelman and Hill (2007) suggest that regression coefficients are complicated to interpret with multiple predictors because the interpretation for any given coefficient is, in part, contingent up on the other variables in the model. Gelman and Hill (2007:34) distinguish between two interpretations of regression coefficients.

- The *predictive interpretation* considers how the outcome variable differs, on average, when comparing two groups of units that differ by 1 in the relevant predictor while being identical in all the other predictors. Under the linear model, the coefficient is the expected difference in y between these two units.
- The *counterfactual interpretation* is expressed in terms of changes within individuals, rather than comparisons between individuals. Here the coefficient is the expected change in y caused by adding 1 to the relevant predictor, while leaving all the other predictors in the model unchanged.

Most management studies use the predictive interpretation for analysing the significant impact of one or more factors on the studied variable. Following a regression analysis suggested by Sambharya (1996), I ran Ordinary Least Squares (OLS) regressions to test three formal models. OLS is one criterion for selecting the best fitting line – *the line that*

makes the sum of squared e values smallest (Hayduk, 1987). For all models, problems of multicollinearity and autocorrelation were analysed.

Multicollinearity refers to the econometric problem of a higher interrelatedness among independent variables of a multiple regression. Ideally, it is expected that there are no inter-relationships among independent variables. However, there are frequently some degrees of inter-relationships in empirical studies because real social and biological factors are not completely independent from the environment. A popular measure for detecting multicollinearity is the Variance Inflation Factor (VIF) analysis. Marquardt (1980:90) suggests that ‘the VIF depends only on the predictor variable data. Therefore, they measure, as intended, the structural independence of each term from all other terms in the model, using the adopted model scaling’. Formally, the VIF is calculated for each independent variable running an ordinary least square regression where the parameter (X_i) is a function of all the other explanatory variables in the first equation 3.1.

$$X_i = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \dots + \beta_k X_k \quad (3.3)$$

Then, the coefficient of determination of the regression 3.3 (R^2) is calculated and is included in the VIF’s equation 3.4:

$$VIF_i = \frac{1}{1 - R_i^2} \quad (3.4)$$

Even though, there are no agreements about the limit for analysing the the magnitude of multicollinearity, a common cut off value is that if VIF is less than 5, then multicollinearity is high (Marquardt, 1980).

On the other hand, a multiple regression model assumes that the disturbance terms are all independent of each other. If this is not the case, the model suffers from *autocorrelation*. The basic test for autocorrelation is the Durbin-Watson test. The statistic can only take values between 0 and 4, with an ideal value of 2 (absence of autocorrelation). The hypotheses considered in the Durbin-Watson test are:

$$\begin{aligned} H_0 : \rho &= 0 \\ H_1 : \rho &> 0 \end{aligned} \tag{3.5}$$

The test statistic is:

$$d = \frac{\sum_{i=2}^n (e_i - e_{i-1})^2}{\sum_{i=2}^n e_i^2} \tag{3.6}$$

Where e_i is the error term in time t . That means $e_i = y_i - \hat{y}_i$ and y_i and \hat{y}_i are respectively, the observed and predicted values of the response variable y . For the econometric analysis I used SPSS 18 software. The SPSS automatically calculates the Durbin-Watson coefficients.

3.2.3 Defining the Constructs of Analysis

Section 2.3.5 (Chapter 2) defines four hypotheses related to the influences of CEOs on the SME internationalisation:

- Hypothesis 1: The CEO tenure is negatively related to the export intensity of SMEs located within a developing country.
- Hypothesis 2: The level of academic achievement of CEOs is positively related to the export intensity of SMEs located within a developing country.
- Hypothesis 3: The CEO with an academic degree in business is positively related to the export intensity of SMEs located within a developing country.

- Hypothesis 4: The CEO age is negatively related to the export intensity of SMEs located within a developing country

These hypotheses were tested by using three OLS models. Models 1 and 2 were built to examine the alternative explanation for why SMEs have different export intensity (Y). Model 1 (Equation 3.7) relates the firm's level (accumulation) of resource to the firm's export intensity ($C_i, \forall i = 1, \dots, 6$) (Dierickx and Cool, 1989). Model 2 (Equation 3.8) expands Model 1 by including the diversity of resources (C_7) (Melin, 1992). Finally, Model 3 (Equation 3.9) shows effects of the full model including control variables and measures of CEO's characteristics ($X_i, \forall i = 1, \dots, 4$) (Hypotheses 1, 2, 3, and 4). Table 3.1 summarises the variables provided by equations 3.7, 3.8, and 3.9. Formally, the three models are defined as:

$$Y = \alpha_0 + \alpha_1 C_1 + \dots + \alpha_6 C_6 \quad (3.7)$$

$$Y = \alpha_0 + \alpha_1 C_1 + \dots + \alpha_7 C_7 \quad (3.8)$$

$$Y = \alpha_0 + \alpha_1 C_1 + \dots + \alpha_7 C_7 + \beta_1 X_1 + \dots + \beta_4 X_4 \quad (3.9)$$

Dependent variable: Export Intensity

The internationalisation strategies of firms in the early stages of internationalisation differ from those of more experienced international firms. Strategies of experienced international firms include: joint venture, direct exports, and foreign direct investments (FDI) (Andersson, 2004). In order to control different metrics to measure the internationalisation

Table 3.1: Constructs of the econometric analysis

Dependent Variable (Y)	Independent Variables (X_i)	Control Variables (C_i)
Export Intensity	CEO tenure CEO age CEO educational level CEO educational background	Firm size 1 (Annual Turnover) Firm size 2 (Employees) Business localisation Communication systems Capital intensity Alliances Resource diversity

performance, I focus my analysis on the internationalisation through exports (Melin, 1992), because there is evidence that exporting is a common strategy of SMEs located within developing countries (Khavul et al., 2010). International studies of SMEs have used the export intensity as a measure for analysing export strategies (Brouthers et al., 2009). In this research, the dependent variable, *export intensity*, has been defined as the ratio of international sales to total sales (Lu and Beamish, 2001).

Independent variables: CEO's characteristics

I measured *CEO tenure* as the number of years of employment in the firm of the main CEO (Finkelstein and Hambrick, 1990); *CEO age* by his/her age at the moment of the survey (Gielnik et al., 2012); and *CEO educational level* by the level of academic achievement of the CEO (Fernandez-Ortiz and Lombardo, 2009). I used a four point scale, ranging from high school degrees [1] to postgraduate degrees [4] to identify the academic achievements. Finally, I measured *CEO educational background* as a dummy variable where 0 = the CEO does not have an academic degree in business, 1 = the CEO has an academic degree in business (e.g., Management, Marketing, Finance, and Economics).

Control variables: Level and Diversity of resources

In the international small business literature, a significant volume of research has explained that resources can create valuable competencies for supporting internationalisation processes (Knight and Kim, 2009; Sapienza et al., 2006; Oviatt and McDougall, 2005a; Knight and Cavusgil, 2004). When SMEs possess idiosyncratic resources that are difficult to obtain, they have a competitive advantage in a foreign market (Liesch and Knight, 1999). According to Nadkarni and Perez (2007), two facets of resources that are considered relevant to internationalisation are the *level* and *diversity*. Although most of the internationalisation literature has focused on the level of resources within a firm, some scholars attribute the success of internationalisation strategies to the resource diversity of the firm (Peng, 2001). In order to control the effects of both the level and diversity of resources, I studied five commonly identified resources in the literature that provide advantages to small firms in foreign markets: *Firm size*, *business localisation*, *communication systems*, *capital intensity*, and *alliances* (Khavul et al., 2010; Lechner and Leyronas, 2009; Nadkarni and Perez, 2007; Andersen).

One of the main arguments in international business theory is that firms internationalise their activities as a natural consequence of their growth (Andersson, 2004). Hence, I measured *firm size* using two measures: (1) the annual turnover of the firm (Acedo and Jones, 2007); and (2) the total number of employees (Cheng and Lin, 2009). Although, natural resource-based firms usually employ a large number of employees for planting, maintenance, and harvesting activities, economies of scale allow companies to reduce the number of employees involved in their activities by implementing mechanisation in their manual processes. This could be a critical success factor when firms decide to follow a low-cost strategy.

Westhead et al. (2001) suggested that SMEs located within resource-rich urban locations are significantly less likely to be exporters. The centralisation of Chile has developed the capital region as the most resource-rich zone. Although the resources required to produce commodities, such as land, are not necessarily located in the capital region, the capital regional's demand for commodities can discourage SMEs from exporting a large part of their annual sales³. Therefore, I measured *business localization* by the geographic zone in which the firm is located. I used a four point scale, where the lowest value is for those firms whose offices are located within Capital Metropolitan Region (RM), and the highest value is for firms whose offices are located within the more distant regions⁴.

According to Knight and Cavusgil (2004) global technological competence is a critical resource for the success of new products, and has the potential to foster information technology and e-commerce proficiency, both of which can positively influence international performance (Zahra et al., 2000). Specifically, internet technology provides opportunities for companies to establish a distinctive strategic position within their markets (Knight and Kim, 2009). Therefore, I measured *communication systems* by the degree of penetration of internet-based systems within the organisation. The highest values are for those firms that possess a higher internet penetration, such as internet services, email services, website, hosting-server and web-server.

Natural resource-based firms are usually capital-intensive firms because they possess large assets to develop their products, especially land. I measured *capital intensity* by the ratio of the total value of assets to sales revenue generated annually (Nadkarni and Perez, 2007). Evidence in SMEs suggests that alliance formation is determined by a com-

³The population of the Capital Metropolitan Region (RM) in 2010 was estimated as 6,883,600 people from a total of 17,094,275 people in Chile (available at www.ine.cl, Demographic statistics, 2010).

⁴Chile is a narrow and large country where the RM is located in the central zone. Distance from Santiago (RM) to the northern border is 2,069 km (1,286 miles) and to the southern border is 3365 km (2,091 miles) (available at www.ine.cl, Regional Geographic Summary, 2010).

Table 3.2: Descriptive statistics and inter-correlations among study variables

Variable		Mean	s.d.	Inter-correlations											
				1	2	3	4	5	6	7	8	9	10	11	12
Firm size (turnover) ^α	size	1.32	0.58	1											
Firm size (employees)	size	242.57	121.78	0.068*	1										
Business localisation		2.53	1.09	0.072*	-0.013	1									
Communication systems		2.18	1.51	0.104**	0.017	0.162**	1								
Capital intensity		0.26	0.54	-0.152**	0.091**	-0.098**	0.080*	1							
Alliances		0.03	0.18	-0.010	-0.016	0.009	0.129**	-0.008	1						
Firm resource diversity ^β	resource	0.861	0.239	0.059	0.047	0.095**	0.112**	0.314**	0.393**	1					
CEO tenure		15.40	11.93	-0.012	0.080*	0.006	-0.011	0.164**	0.041	0.058	1				
CEO education level		0.71	0.99	-0.052	0.113**	-0.047	-0.092**	0.091**	-0.059	0.105**	0.344**	1			
CEO education background	education	0.16	0.37	0.121**	-0.029	0.138**	0.357**	0.107**	0.067*	-0.020	0.016	-0.126**	1		
CEO age		51.36	11.51	0.001	-0.068*	0.044	0.001	0.005	0.050	0.025	0.018	-0.062	0.012	1	
Export intensity		0.04	0.17	0.100**	-0.186**	-0.031	0.085*	0.067*	0.037	0.044	-0.085**	-0.064	0.182**	0.015	1

Two-tailed P-values: * $p < 0.05$ ** $p < 0.01$

^α Annual turnover (million pounds (£))

^β The lower the score, the higher the resource diversity

bination of organisational, partner, and industry-related motives that differ according to firms (Van Gils and Zwart, 2009). Alliances, especially with distributors, are important when selling in international markets. I measured *alliances* by a dummy variable where 0 = the firm does not possess alliances, 1 = the firm possesses alliances (Bell, Crick and Young, 2004).

Finally, in order to control influences of the resource diversity, I measured *resource diversity* of the firm by the coefficient of variation (σ/μ) across the standardized z-scores of the five resources mentioned before (Dooley, Fowler and Miller, 1996). If a firm possesses a high level of only one or few resources, then the coefficient of variation across the five resources will be very high. Consequently, a lower coefficient of variation across the five categories implies that firms develop a diverse set of resources, and therefore the resource diversity is higher (Nadkarni and Perez, 2007).

Table 3.2 shows the means, standard deviations and inter-correlation matrix for all variables of this study. In several cases, significant pair-wise correlations among variables suggest the possibility of multicollinearity and autocorrelation. Therefore in Chapter 4, I will test these problems employing the variance inflation factor and the Durbin-Watson test.

3.3 Inquiry 2. Case Study Research

The theory development of this case study research is mainly inductive (Eisenhardt, 1989). Every SD model developed by CEOs is an individual theory of how they run an internationalisation process. These models show cognitive structures which are perceptions of the resource system that trigger the resource development over time (behaviour). Theorizing about individual decision-making processes can open up a new stream for OR/MS

studies in strategy arena. Chapter 2 showed that the literature on OR/MS and the strategy has focused on developing group and organisational theories based on successful intervention in organisations. Using reflective engagement and analytical reasoning supported by models (Dyson et al., 2007), OR/MS researchers have developed theories of work teams (Scott-Young and Samson, 2009), group problem-structuring (Rosenhead and Mingers, 2001; Franco, 2009), group problem-solving (Barcus and Montibeller, 2008), and policy analysis (Eden and Ackermann, 2004), but with little concern about supporting the individual decision-making process of CEOs.

The case study research has used a facilitated SD modelling approach (Rouwette, 2011). This approach emphasises the active role played by the research to facilitate the firm's strategy rehearsal which is one of the activities of the strategic development process (Dyson et al., 2007). Rouwette (2011) suggests that the impact of facilitated modelling centres on eliciting relevant information and clarifying strategic ideas to reach consensus among decision-makers. The aim of Section 3.3 is to detail and discuss how the cases, participants, methodologies, and the elicitation process were selected to support the internationalisation of five small firms.

The remainder of Section 3.3 is divided into six subsections. First, the description of the industries involved in the modelling process is shown. Then, the selection of the case studies and the profile of the participants are described. Third, the core concepts and elements of the SD modelling are discussed. Fourth, the SD model parameterisation and its procedures for validating the CEO's model of the internationalisation are listed. Fifth, the method for comparing SD models which is used to develop the comparative study across cases is detailed. Finally, the protocol for supporting the internationalisation of the five SMEs is described.

3.3.1 Description of the Industries involved in the Modelling

The industrial sectors involved in the case study-intervention are: the wine, fruit, and fish sectors. These sectors are characterised as having global networks, which means that firms are part of a network whereby production takes place in a particular context, but most of the sales are globally integrated to international suppliers and customers. The term network avoids the connotation of the simple interaction between buyers and suppliers and emphasises that the economic environment in their social contexts affects the whole internationalisation process (Levy, 2008).

The Chilean Wine Industry

In the last 20 years the Chilean wine industry has been commonly recognised for achieving great success in exports, competing with traditional wine-makers located, for example, within France, Spain, South Africa, and the United States (Knowles and Sharples, 2002). Factors that might explain this phenomenon are either *external factors*, such as the availability of grapes, special environmental conditions, and the wines' global attractiveness (Leonidou et al., 2007) or *internal factors*, such as the replacement of old production methods for new technology, managerial practices and experiences (Marcel, Barr and Duhaime, 2011; Kunc, 2007). Even though the Chilean wine industry started in the 19th century, the highest impact was later determined by small groups of local entrepreneurs which came to penetrate premium wine market segments using simple imitation processes of the practices employed mainly in Europe (Egan and Bell, 2002). Despite the fact that the Chilean wine industry has performed remarkably well (Kunc, 2007), the performance of firms is not guaranteed, because favourable external conditions, as well as idiosyncratic resources, are a *necessary* but *not sufficient* condition for success in international markets.

According to Gwynne (2008), the Chilean wine companies can be divided into three segments: wine company groups, newly established companies, and old established wine firms. Although every firm focuses its strategy on upgrading the quality of wine through time, often bigger companies are most interested in selling wine extensively to the less sophisticated wine customer segments, such as supermarkets. On the other hand, the smaller Chilean wine companies focus their attention on the chains of specialist retailers, local independent wine merchants, pubs, and restaurants because they have limited stock and the potential for producing a great number of bottles for each market. While only Chile's largest companies have set up their own distribution companies in their foreign markets (an example is Concha y Toro in the UK), small and medium-sized wine firms have local distributors that support them during the distribution process to the customers. Every distributor has different requirements that characterises each of its customer's portfolio. Therefore, the decision to select a distributor can determine the success of the internationalisation. The role of distributors is to coordinate the product entrance; nonetheless, interesting conflicts emerge when rival firms negotiate with similar distributors and agreement conditions differ between each company. Moreover, when retail concentration occurs within a specialist wine retailing group, wine companies have less margin for negotiating wine prices. This gives them the incentives to contact new distributors and small-scale wine retailing buyers, such as independent wine merchants, internet traders, and mail order wine retailers.

The Chilean Fruit Industry

Chile has increased its exports of fruit over the last 10 years. The Chilean fruit exports grew from £170 million in 2001 to £2,593 million in 2011 – that means an increment of 1,422 per cent in the decade⁵. In 2007 (the last Chilean agricultural census), Chile had 308,445 (ha) of fruit orchards: an increase of, almost 32 per cent from the previous census

⁵Direcon, Statistics of the Chilean Government (May 2012), available at <http://www.direcon.gob.cl/>.

(1997). The most important species were table grapes 20 per cent, avocados 13 per cent, and apples 12 per cent. The 22 per cent of the fruit crops growing area corresponded to juvenile orchards; within the species with higher proportion of juvenile orchards were prunes 42 per cent and blueberries 56 per cent (Retamales and Sepulveda, 2011). As with the wine industry, factors that might explain the success of fruit export are the availability of different varieties of fruits, special environmental conditions, the fruit's global attractiveness, the replacement of old production methods for new technology, and managerial practices (Leonidou et al., 2007; Marcel, Barr and Duhaime, 2011).

The Chilean fruit industry is characterised by dominant family firms that have inherited the land and production expertise. These kind of firms usually produce simple products and are controlled by buyers that derive power from high purchasing volumes determining conditions of production and requirements for product characteristics. In the last few years, these Chilean firms have shown both growth and diversification focused on developed markets. This expansion has been a result of the joint effort from both public and private sectors (Retamales and Sepulveda, 2011). Even though Chile is the leading export country of fresh fruit within the southern hemisphere – having the 40 per cent share of the total exported from the region in 2007 (Retamales and Sepulveda, 2011) – it has to increase its competitiveness in order to face rival firms located within competitor countries, such as South Africa, Argentina, and New Zealand. Consequently, in 2010 the Chilean National Council for Competitiveness⁶ recommended these firms to (1) increase the diversity of markets; (2) enhance the quality of the products to access to markets that are able to pay higher prices for the fruit; (3) enhance productivity by improving the standards of growers and workers; and (4) incorporate new land into production.

⁶Source (May, 2012), available at <http://biblioteca.cnice.cl>.

The Chilean Fish Industry

The natural conditions of the Chilean coast represent a great advantage for fish firms. The waters are rich in plankton and thus able to sustain a large diversity of life (Thorpe et al., 2000). Chile is the tenth largest aquaculture producer by volume; the growth rate of the Chilean aquaculture production 12 per cent has been greater than the world average 7 per cent in the 1998—2004 period (Morales et al., 2008). This success is the result of both the growth in the demand for seafood and the replacement of old extracted methods and ships for new technology (Thorpe et al., 2000). Nonetheless, in 2010, one of the biggest earthquake and Tsunami strongly affected the Chilean aquaculture industry, specially the fish sector. During March 2010 the national production of fish decreased 53 per cent compared with the same month in 2009. In fact, during 2010, the annual national production reached 3,767,000 (tons) that represents a 18 per cent less than the year 2009.

In Chile, fish firms can be divided into firms that cultivate sea products, and those that extract it from the sea (they are also called traditional extractive firms). Those traditional firms that extract resources from the sea can be divided into fishermen (handcrafted fishing organisations) and industrial fish firms. Although the Chilean fish firms have performed relatively well in the last few years, business performance across companies has varied greatly in terms of export volumes, international market penetration, and added value (Morales et al., 2008).

3.3.2 Selecting Cases

The selection of cases is an important aspect of this research, because ‘it defines the set of entities from which the research sample is to be drawn’ (Eisenhardt, 1989:537). I have selected a group of SMEs in specific industrial sectors – the wine, fruit, and fish industries – because there is evidence that within these sectors, SMEs have similar internationalisa-

tion processes (Khavul et al., 2010). Comparative analyses in similar contexts are useful for decreasing the effects which are exclusively associated with the market's influence. For example, Hutchinson, Quinn and Alexander (2006) have developed a comparative analysis using nine case studies in the UK's retail sector to analyse possible barriers, international stimulus, international drivers, process of international development, and entry mode strategies. A similar case study research on SME, but in the international marketing area, was led by Merrilees and Tiessen (1999). They developed 12 case studies using a semi-structured survey protocol to support findings.

I sent around 20 request letters to similar international SMEs located within the central zone of Chile, receiving back five positive answers (Appendix A). These companies were: LR, IW, AF, CT, and FT, all of which are located within the Chilean central zone. This zone has an area of 60,000 Km^2 (23,167 square miles) approximately. I used an abbreviation to refer the name of these companies because this condition was part of the Informed Consent Form (Appendix B). Also, these export companies are natural resource-based firms with less than 100 employees, an annual turnover up to £2.8 millions, and export more than 70 per cent of their sales. In the literature of international businesses, it is attractive studying firms that export intensively because often they do not follow the classical sequence internationalisation process – gradual acquisition, integration, and positioning within foreign markets (Autio et al., 2000; Oviatt and McDougall, 2005). The five participants are CEOs from export SMEs within wine, fruit, and fish industrial sectors in Chile (See Figure 3.1).

The first case study considers the *LR* wine company. This Chilean wine company has been located in the Cachapoal Valley for 60 years. Their vineyards produce Cabernet Sauvignon, Merlot, Chardonnay, Sauvignon Blanc, Syrah, Riesling, Pinot Noir, Malbec,



Figure 3.1: Pictures of all interviewed CEOs. From left to right: Juan (LR), Irene (IW), Felipe (CT), Ismael (AF), Ignacio (FT)

and Carménère varieties which are used in the production of a complete range of wines. The top management team consists of four shareholders, a general manager (CEO), and one sales manager. The shareholders, which are the original founders, belong to the family Orueta. Nonetheless, the current CEO and wine-maker is Juan who has been in this role since 2007 (he does not belong to this family). He is an agronomist engineer with an MBA. He is 38 years old and has 12 years' experience of making and exporting wines. He also speaks fluent Spanish, English, and French and has previously worked for a French wine company for one year.

The second case study examines the *IW* wine company. This Chilean *boutique* wine firm specialises in premium wines. It has been in the Cachapoal Valley for five years. Their vineyards produce Chardonnay, Syrah, and Carménère varieties which are used in the production of top quality reserve wines. This wine company is led by the owner, wine-maker, and CEO called Irene. She is one of the prominent wine-makers in Chile, and her clients include the following Chilean wine companies: Erraruriz, Caliterra, Tabali, and San Pedro. She is an Agronomist Engineer with an MBA. She is 46 years old and has 20 years' experience in making wines and five years's experience in exporting wines. She speaks Spanish and English. Currently she also advises three small wine firms in how to produce

wine.

The third case study concerns the *CT* fruit company. This small Chilean firm specialises in producing and exporting dried plums. Located in Chimbarongo, a small town within the Colchagua Valley, the firm started two years ago. Felipe is the owner and CEO of the company. He is an agronomist Engineer with 10 years' experience in producing and cultivating export fruits. He is 34 years old and speaks Spanish. CT is his first exporting firm.

The fourth case study looks at the *AF* fruit company. This Chilean firm exports several varieties of fruits, such as apples, apricots, oranges, plums, pears, and table grapes. It is located within the Curico Valley. Ismael, the CEO of AF, shares the ownership with his father and his two brothers-in-law. He belongs to the third generation of a fruit-producing family. His father was the CEO for 40 years and he is one of the first Chilean entrepreneurs who began to exports their products as part of his business model. Ismael is an agricultural technician with 22 years' experience producing, cultivating, and exporting fruit orchards. He is 45 years old and only speaks Spanish.

The fifth case study examines the *FT* company. FT is a Chilean export company that started as a cargo agency located in Santiago, Chile, with 12 years' experience in the market of exporting fresh fish, especially austral hake fish extracted from southern of Chile (X, XI, and XII regions). The average export sales is 500,000 (kg/month), nevertheless, fish capture is a seasonal activity with extracting restrictions during August. Currently, the company's headquarters are located in Santiago. It possesses five fish processing plants; three of them are traditional plants and the other two are industrial plants. All plants are located to where the catch takes place. This company collects the fish from their own fish processing plants, as well as from industrial fisheries and fishermen, and then sends

the products by aircraft to the Spanish market. Additionally, FT has five fish suppliers with a different variety of hake products, such as fillet, cheeks, and hake with/without the head. Ignacio is the CEO and owner of FT. He is a automotive technician with 25 years' experience in exporting fish. He is 52 years old and speaks Spanish. For several years, he worked for an aircraft airline.

Table 3.3: Summary of the five CEOs who participated of this research

Name	Firms	Industry	Age (years)	Experience (years)	Tenure length (years)	Education (degree)	P Grad. (degree)	Languages
Juan	LR	Wine	38 years	12 years	4 years	Agronomist Engineer	MBA	Spanish, English, French
Irene	IW	Wine	46 years	20 years	4 years	Agronomist Engineer	MBA	Spanish, English
Felipe	CT	Fruit	34 years	10 years	2 years	Agronomist Engineer	No degree	Spanish
Ismael	AF	Fruit	45 years	22 years	8 years	Agricultural Techni- cian	No degree	Spanish
Ignacio	FT	Fish	52 years	25 years	12 years	Automotive Techni- cian	No degree	Spanish

Table 3.3 summarises the profile of the five participants. In order to control external factors that may affect findings, I selected a group of CEOs with similar background characteristics, such as age, experience, tenure, and education. The five CEOs are between 34 and 52 years old, have more than 10 years' experience and similar educational backgrounds. Another external factor controlled was the selection of firms located within the same geographical zone with similar internationalisation processes. All of these companies are located within the Central Valleys of Chile (i.e. similar weather conditions, culture, and

economic and political environment) and export wine, fruit, and fish. These commodities do not need any kind of sophisticated manufacturing to be sold in international markets.

3.3.3 Meetings of the modelling process

The modelling process has used documentation, archival records, interviews, and direct observations for modelling the internationalisation process of five SMEs. Documents of exports and customers were gathered, visits to look at operations were made, and tape and video-recording were made. These sources of data were employed to complement information extracted from meetings. Before I started the round of meetings, I asked each CEO to sign an Informed Consent Form explaining the objectives of the doctoral research, and all procedures during the time of study (Appendix B). The meetings started in August 2010 and were finalised in December 2010 in all firms. The modelling process was initially divided into four meetings of approximately two hours each. However, in most of the cases, I held two sessions in one meeting. The main reason was the long distance between Santiago (Chile) and the headquarters of the firms. All of them were located within a range of 100 miles. Simultaneously, I followed up the manufacturing process of these companies. I took pictures, video recording and notes of the manufacturing processes in-situ to garner additional information as a supplement to the CEO's sessions.

Meetings at LR

The modelling process involving LR included three meetings with the CEO. The first two meetings involved modelling and the last meeting was for validating the CEO's SD model. Meeting 1 was developed on Friday 1 October 2010 in Graneros. Graneros is an old rural town located within the Cachapoal Valley (50 miles from Santiago of Chile). Meeting 1 took two hours. The main output of this meeting was to understand the current internationalisation process through a semi-structured interview which included some

preliminary conceptualisation using generic diagrams. Meeting 2 was developed on Friday 22 October 2010. In this meeting, the CEO and I developed the modelling. After these meetings, I analysed in depth the modelling using notes, photographs, video and voice records, and I formalised the SD models using quantitative equations to run simulations. Between meetings 2 and 3, I asked the CEO for historical data for running the SD models. Meeting 3 was held on Monday 8 November 2010. Here, I validated the final SD model and discussed several strategic initiatives with the CEO.

Meetings at IW

The modelling process involving IW included two meetings with the CEO. The first meeting involved modelling and the last meeting was for validating the CEO's model. Meeting 1 was held on Monday 18 October 2010 in Peumo. Peumo is a rural sector located within the Cachapoal Valley (87 miles from Santiago). Meeting 1 took two hours and a half. The main output of this meeting was to understand the current internationalisation process through a semi-structured interview which included some preliminary conceptualisation using generic diagrams, as well developing the first SD model. After this meeting, I analysed in depth the modelling using notes, photographs, video and voice recordings, and I formalised the SD models using quantitative equations to run simulations. Between meetings 1 and 2, I asked the CEO for historical data for running the SD models. Meeting 2 was held on Monday 29 November 2010. Here, I validated the final SD model and discussed several strategic initiatives with the CEO.

Meetings at CT

The modelling process involving CT included two meetings with the CEO. The first meeting involved modelling and the last meeting was for validating the CEO's SD model. Meeting 1 was held on Tuesday 12 October 2010 in Santiago. Felipe has a farm in Chim-

barongo, a small town within the Colchagua Valley (162 miles from Santiago). The main output of this meeting was to understand the current internationalisation process through a semi-structured interview which included some preliminary conceptualisation using generic diagrams as well developing the first SD model. After this meeting, I formalised the SD models using quantitative equations to run simulations. Meeting 2 was on Monday 15 November 2010. Here, I validated the final SD model and discussed several strategic initiatives with the CEO.

Meetings at AF

The modelling process involving AF included three meetings with the CEO. The first two meetings involved modelling and the last meeting was for validating the CEO's model. Meeting 1 was held on Thursday 28 October 2010 in Santiago. The main output of this meeting was to understand the current internationalisation process through a semi-structured interview which included some preliminary conceptualisation using generic diagrams. Meeting 2 was held on Wednesday 10 November 2010. In this meeting, the CEO and I developed the modelling. After these meetings, I analysed in depth the modelling using notes, photographs, video and voice recordings, and I formalised the SD model using quantitative equations to run simulations. Between meetings 2 and 3, I asked the CEO for historical data to run the SD model. Meeting 3 was on Friday 19 November 2010. Here, I validated the final SD model and discussed several strategic initiatives with the CEO.

Meetings at FT

The modelling process involving FT included two meetings with the CEO. The first meeting involved modelling and the last meeting was for validating the CEO's model. Meeting 1 was run on Tuesday 30 November 2010 in Santiago. The meeting 1 took two hours. The main output of this meeting was to understand the current internationalisation

process through a semi-structured interview which included some preliminary conceptualisation using generic diagrams, as well developing the first SD model. After this meeting, I analysed in depth the modelling using notes, photographs, video and voice recordings, and formalised the SD models using quantitative equations to run simulations. Between meetings 1 and 2, I asked the CEO for historical data to run the SD model. Meeting 2 was held on Monday 27 December 2010. Here, I validated the final SD model and discussed several strategic initiatives with the CEO.

3.3.4 Supporting Strategy using System Dynamics

Chapter 2 showed several OR/MS approaches for supporting strategy processes. However, this doctoral thesis explores the use of SD modelling to support the internationalisation process through strategy rehearsal. Although there are other approaches to rehearse strategy, such as agent-based models, profit impact of market strategy, and balanced scorecard (Dyson et al., 2007), I decided to use SD modelling because this approach helps people understand how strategies will perform over time, what might be wrong, and what kind of intervention can be done (Kunc and Morecroft, 2009). Also SD can help companies to develop corrective actions from real-world feedback with virtual performance to improve strategic foresight (Kunc and Morecroft, 2007a).

In traditional SD, the sequence of modelling activities is as follows: the conceptualisation of the problematic situation; the development of model equations; the development of a simulation to understand dynamic behaviour; the evaluation of alternative policies; learning from the model and choice of appropriate policy; and finally, implementation (Forrester, 1994). However, when there is no consensus among decision-makers about the system underlying decisions and the hypotheses (theory) generated for explaining how the system is creating the troubling behaviour, the steps of traditional SD modelling are not

straightforward. Under these circumstances, an objective representation of the dynamic system is not reachable because decision-makers have different ideas (mental models) of the problem (reality) (Kunc and Morecroft, 2009). Rouwette (2011) argues that facilitated modelling is useful in supporting the resolution of strategic issues when it is expected to improve communication between decision makers, foster consensus and create commitment. Otherwise, models developed and interpreted by outside experts rarely change the way managers think about strategic issues (Senge and Sterman, 1992). Hence, the facilitated modelling process can improve CEOs' abilities to view new situations systematically and dynamically (Morecroft, 2007). This view of SD modelling considers that CEOs themselves become the modellers of their strategy process. Although there is a high risk of modelling a mental model that is affected by misperception of feedbacks (Sterman, 1989a), this is the real driver that leads to implement the strategy.

Decision-makers argue that information about their firm's performance feeds back to modify or reinforce the initial decisions for implementing a strategy (Kunc and Morecroft, 2010). This feedback processes and its circular causality has been a central point in the study of the dynamics of systems in social sciences (Rahmandad et al., 2009). In system dynamics modelling, a causal relationship is denoted using an arrow connecting a X factor that is causally influencing Y (e.g., $X \rightarrow Y$). This relationship can be either positive (+) or negative (-). When the relationship is positive(/negative) means that an increase in X leads to an increase(/decrease) of the level of Y . When there are several significant causal factors X_1, X_2, \dots, X_n influencing Y , this relationship is formally denoted:

$$Y = f(X_1, X_2, \dots, X_n) \quad (3.10)$$

However, when X and Y are affected mutually ($X \rightleftharpoons Y$), these relationships create a feedback loop. Feedback loops are defined as interactions among components of a system linking actions, events, or pieces of information (Sterman, 1989a). Even though complexity is a relative term, most complex behaviour usually depends on the number and the nature of interactions among the components of a system instead of on the complexity of the components themselves (Gharajedaghi, 2006). All dynamics arise from the interaction of two types of feedback loops, positive and negative. Positive loops are self-reinforcing thereby generating exponential growth or decline. For example, if a firm increases its marketing activities to gain market share in a local market, its customers may respond by buying more products on sale. On the other hand, negative loops are self-correcting thereby counteracting change. Following the last example, the higher product demand can affect the customer service quality when market dynamics are rapid relative to capacity adjustment. In fact, forecasting errors may lead to a lack of capacity that finally can lead to a decrease in the number of customers (See Figure 3.2).

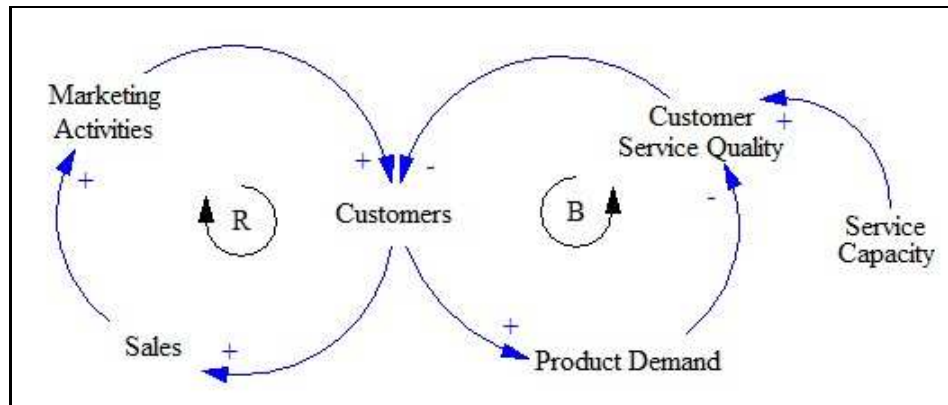


Figure 3.2: Example of reinforcing and balancing feedback loops

Within the SD field, the concept of feedback information plays a central role in explaining the link between system structure and behaviour (Sterman, 2000). The feedbacks imply that, ‘decisions are not entirely *free will* but are strongly conditioned by the en-

vironment’ (Forrester, 1961:17). In decision-making processes, the feedback system can enhance the understanding of how individuals or groups make one or more decisions in each time period, based on the information available (Gary et al., 2008). However, during the decision-making process, managers might be affected by insufficient, unclear, or conflicting information about the results obtained from their decisions (Kunc and Morecroft, 2007a). According to Morecroft (2007:5), ‘people’s ability to manage their complex world can be improved by visualizing and simulating it’. In this sense, stock-and-flow diagrams help to build mental models and represent the basic knowledge structures that managers use to make strategic decisions (Kunc and Morecroft, 2009). In this research, it has considered a stock-and-flow diagram a set of strategic resources connected by arrows denoting the causal influences among the variables extracted from the CEO’s mental model of the analysed process. Strategic resources can be considering as asset stocks (Dierickx and Cool, 1989). These stocks are graphically represented as a rectangle that accumulates their inflows and outflows. An inflow is drawn as a valve connected with an arrow that begins from a source and point at the stock. Outflows are represented with the same symbol but the flow is originated in the stock and ends up in a sink (source and sink are drawn as a cloud) (Kunc and Morecroft, 2007a).

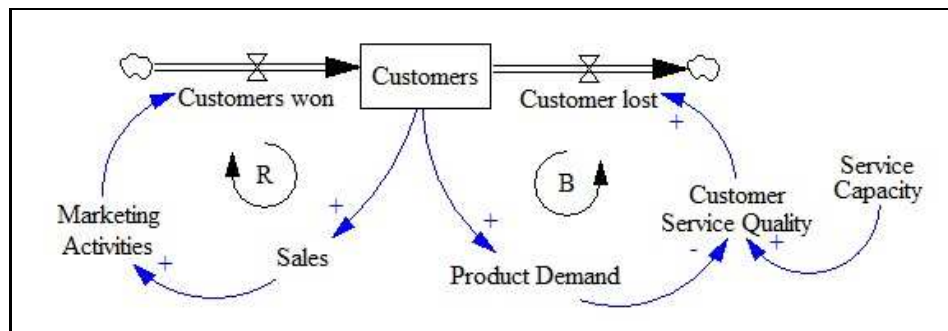


Figure 3.3: Asset stocks and flows in SD modelling

In SD modelling, representations of stocks are depicted by integral equations. These equations are employed to simulate the logical consequences, which help firms to understand the dynamics underlying the system. In this sense, Equation 3.11 formalises a strategic resource i (stock) (R_t) as the initial value of the resource ($R_i(0)$) plus the integral of investment in this resource over time ($r_i(t)$):

$$R_i(t) = R_i(0) + \int_0^t r_i(t)dt \quad (3.11)$$

The current rate of accumulation $r_i(t)$ of resource i at the time t is a function of the current level of all existing resources affecting it ($R_1(t), R_2(t), \dots, R_n(t)$), including exogenous factors denoted generically as $E(t)$.

$$r_i(t) = f(R_1(t), R_2(t), \dots, R_n(t), E(t)) \quad (3.12)$$

Asset stock accumulations lie at the core of all SD representations, whether or not the modellers of the analysis choose to make it explicit (Warren, 2004). Warren (2004) argues that *Stocks provide the only mechanism by which information and material can be passed forward through time*. Unfortunately, the cognitive ability of managers visualising the outcome of asset stock and closed loop systems is limited, especially when a certain action has a varying effect on an outcome depending on its intensity level (Sterman, 1989b). These non-linear dynamics are not an unusual phenomenon. Indeed, many managerial situations are affected by conditions that change depending on uncertain factors. For example, in Figure 3.3 the rate of customer loss can impact the company differently depending on the level of rise or fall of the *product demand* and the *service capacity*.

As people's perceptions about a particular system differ because of the way in which individuals perceive the links among environmental factors, decisions are dependent on

the individual's mental models. In this case, the *real system* cannot be described before a consensus is reached among individuals. Forrester (1994) postulates that the level-rate-feedback structure of SD is indeed the fundamental structure of the real social/physical systems. However, within organisations, this idea cannot be validated against the part of the real world being modelled because stakeholders are constantly changing the structure of the system. Regarding this view, models only show the perception of the real world at a specific point of time. This affects managers' modes of theorising their own strategic decisions (Colbert, 2004).

In this research, simulation of SD models are based on the CEOs' perception of their own organisation's set of resources. Hence, the simulations allowed the analysis of the robustness of a CEO's assumptions about the perceived resource system. This is not the traditional SD approach of simulation. Nonetheless, once there is agreement with CEOs in supporting one view of strategy, SD modelling can help to explore the solution space by rehearsing the preferred strategy through simulation. In this case, SD models are used as *transitional objects* to facilitate dialogue and the exploration of future internationalisation strategies. Then 'simulations can help managers discover hidden pitfalls in strategy by allowing them to rehearse resource building (a task which is dynamically complex due to interdependencies, time delays and non-linearities' (Kunc and Morecroft, 2009:198).

3.3.5 SD Model Parameterisation and Validation for Supporting Strategy

The justification underlying the SD model parameters varied as efforts were made to utilise all the available data as recommended by Homer (1997). According to Taylor and Dangerfield (2005), the approximations and assumptions made during the modelling should serve for the purpose of the model. Hence, in the whole case studies, all assumptions and

approximations will be made by CEOs. Archival data will provide historical data for running simulations. If the CEOs provide insufficient numerical data to estimate functions econometrically (Sterman, 2000), functions can be estimated either by (1) drawing smooth lines to construct the functions, or (2) calculating from the actual activity rates (Taylor and Dangerfield, 2005). Only some parameters related to the fish stock in the FT model (model 5 in Chapter 5) were estimated based on the Fishery model developed by Morecroft (2007). The calibration of several parameters resulted from the CEOs' descriptions during the validation sessions.

While it is clear that the application of traditional System Dynamics are widely used for modelling business dynamics, it is less clear how to evaluate the success of facilitated modelling involving the resource system perceived and developed by CEOs of small organisations. Therefore, is it possible to measure their contribution more rigorously, comparing this approach of SD modelling with other methods? Mingers and Rosenhead (2004) have suggested two different approaches for tackling this question. The first approach is to take an interpretive view where this question is not possible to answer because every instance of its use will be unique, and because problematic situations are bound in a particular space and time (Checkland, 1981). An alternative approach is to take a positivist view in which a methodology can be evaluated based on *theoretical validity* and *experimental validity* (Finlay, 1998). Rouwette et al. (2009) support this last approach arguing that *theoretical validity* allows researchers to test the coherence of the method's theory and its similarity to the practical use of the method. This approach of SD modelling requires two different dimensions to be validated: a *learning (explanatory) dimension* in which the purpose is to validate SD models through the decision-maker judgements, and a *theoretical dimension* focused on an analytical validation. Morecroft (2007) called these two types of validations *structure validation* and *behaviour validation* respectively.

The *learning dimension* can be validated with the CEOs during meetings. Here the validation process is focused on understanding whether the models developed in sessions are coherent with the description recorded on voice and video recordings. This means analysing whether the emergent relationships among constructs fit with the evidence in the case (i.e. visiting the harvest and making-wine process, and seeing additional documents and databases concerned with the internationalisation). Within the structure validation, Morecroft (2007) highlights three analyses: (1) *dimensional consistency* where all equations must be dimensionally correct without the use of non-real-world parameters, (2) *parameter verification* where all parameters must be suggested by the CEO and (3) *extreme conditions* where scenarios provided by simulations make sense under extreme conditions.

On the other hand, the *theoretical dimension* was validated by using common statistics for assessing the model fit to data. The idea of using statistical measures is not to provide evidence of the model's prediction power, but it is to analyse the robustness of the CEOs' assumptions underlying the SD models. Although there are several metrics available to assess the model's fitness to data, Morecroft (2007) highlights two popular metrics: the Mean Absolute Error (MAE) and Mean Square Error (MSE). He suggests that such metrics compute, point-by-point, the discrepancy between simulated and real data and then take an average over the relevant time horizon. The MAE is defined as the sum of absolute differences between the model generated data points X_m and actual data points X_a divided by the total number of data points n .

$$MAE = \frac{1}{n} \sum_{i=1}^n |X_m - X_a| \quad (3.13)$$

The lower the mean absolute error, the better the fit. Hence, if the simulated data perfectly matches the actual data, point-by-point, then the MAE is zero. Alternatively,

the MSE is defined as the sum of the squares of the differences between the model generated data points X_m and actual data points X_a divided by the total number of data points n .

$$MSE = \frac{1}{n} \sum_{i=1}^n (X_m - X_a)^2 \quad (3.14)$$

In this metric, the lower the MSE the better the fit. Morecroft (2007) suggests there is no particular criterion for deciding which of these two metrics, MAE or MSE, is better. However, the MSE has the advantage that it can be decomposed into three separate components. These components represent how much of the mean square error between simulated and actual trajectories can be explained by: (1) the unequal mean statistic or bias (U^M) resulting from a difference between means; (2) unequal variation (U^S) due to a difference in standard deviation; and (3) unequal covariation (U^C) caused by phase shift or unexplained variability. The sum of these three components ($U^M + U^S + U^C$) is equal to 1.

The unequal mean statistic U^M is the square of the difference between the mean of the model-generated data points \overline{X}_m and the mean of the actual data points \overline{X}_a , divided by the MSE.

$$U^M = \frac{(\overline{X}_m - \overline{X}_a)^2}{MSE} \quad (3.15)$$

The unequal variation statistic U^S is the square of the difference between the standard deviation of the model-generated data points s_m and the standard deviation of the actual data points s_a , divided by the MSE.

$$U^S = \frac{(s_m - s_a)^2}{MSE} \quad (3.16)$$

Finally, the unequal covariation statistic U^C is the square of the difference between the standard deviation of the model-generated data points s_m and the standard deviation of the actual data points s_a multiplied by double the complement of the correlation coefficient $(1 - r)$, divided by the MSE.

$$U^C = \frac{(s_m \cdot s_a) \cdot 2(1 - r)}{MSE} \quad (3.17)$$

3.3.6 Method for Comparing SD Models

Research about mental models in management science highlights the relevance of an elicitation, and comparison of mental models in exploring the cognitive structures of members of organisations (Eden et al., 1992). Studies⁷ have assessed the degree of similarity between either models of different subjects (Doyle et al., 2008) or between different versions of a model of one subject before and after an intervention (Markoczy and Goldberg, 1995). Schaffernicht and Groesser (2011) introduce a method to compare mental models of a dynamic system which can be used in both. I selected this method because it modifies the distance approach (Markoczy and Goldberg, 1995) by accounting for delays between cause and effects as well as feedback loops and their polarities. The distance ratio approach is based on comparing the number of variables and links of two models. It divides the number of actual differences between both by the number of potential differences and produces a distance ratio that is a non-negative number that expresses the degree of difference between both models. The ratio ranges from 0 in which *all variables and links are identical; thus, the models are identical* to 1 in which *all variables and links are different, thus, the models have no commonalities*. Also, it is important for comparing models to use the same elicitation process. This process will be described in the next section.

⁷For a complete list of studies about the comparison of mental models of dynamic systems see: Groesser and Schaffernicht (2012).

Assuming two different models A and B were elicited and measured using the same procedure. Each model consists of a number of variables v where the adjacency matrix $A_{(vxv)}$ and $B_{(vxv)}$ contains all variables of both models. V_c is defined as the set of common variables between models A and B; V_{uA} is defined as the amount of variables unique in A; and V_{uB} is defined as the amount of variables unique in B. The rows of matrix AB is numbered from 1 to v using an index i , and columns from 1 to v using index j . Each variable is assigned to a row and a column. Links among variables will appear in the elements of A and B; positive integers denote a positive link polarity, while negative integers denote a negative link polarity. If in model A a link between the variables r and c exists, then cell $a_{r,c} \neq [0]$; if there is no causal relation between both variables, then $a_{r,c} = [0]$.

Markoczy and Goldberg (1995) incorporate a number of parameters that allow the choice between several options for counting differences. Parameter α expresses the possibility of including self-loops in the model (0 = possible ; 1 = not possible). A self-loop is given when a variable influences itself directly. Parameter β represents the highest possible link strength, which accommodates the method to mapping approaches that elicit links with different strengths. Parameter γ determines how differences between the sets of causal links in the two models are interpreted. Parameter δ indicates if a difference in polarity between two causal links is more important when the involved links have different strengths. Parameter ϵ represents the number of possible polarities.

Formally, the distance ratio is expressed as follows (Markoczy and Goldberg, 1995):

$$DR(A, B) = \frac{\sum_{i=1}^v \sum_{j=1}^v diff(i, j)}{(\epsilon\epsilon + \delta)v_c^2 + \gamma(2v_c(v_{uA} + v_{uB}) + v_{uA}^2 + v_{uB}^2) - \alpha((\epsilon\beta + \delta)v_c) + \gamma(v_{uA} + v_{uB}))} \quad (3.18)$$

Subject to:

$$diff(i, j) = \begin{cases} 0 & \text{if } i = j \text{ and } \alpha = 1 \\ \Gamma(a_{ij}, b_{ij}) & \text{if either } i \text{ or } j \notin V_c \text{ and } i, j \in V_A \text{ or } i, j \in V_B \\ |a_{ij} - b_{ij} + \delta| & \text{if } a_{ij}b_{ij} < 0 \\ |a_{ij} - b_{ij}| & \text{otherwise} \end{cases} \quad (3.19)$$

$$\Gamma(a_{ij}, b_{ij}) = \begin{cases} 0 & \text{if } \gamma = 0 \\ 0 & \text{if } \gamma = 1 \text{ and } a_{ij} = b_{ij} = 0 \\ 1 & \text{otherwise} \end{cases} \quad (3.20)$$

In Equation 3.18, the numerator represents the number of relevant differences between the elements of A and B . The denominator constitutes the largest possible differences that can exist between A and B . Assuming several specifications of system dynamics modelling, Schaffernicht and Groesser (2011) adapt Equation 3.18 to compare SD models. First, in System Dynamics, self-loops are not feasible; thus, $\alpha = 1$. Second, the parameter β varies from 1 to 2; 1 represents a non-delayed link, and 2 a delayed link. These numbers do not indicate that a delayed link counts twice; rather, they express the fact that a delayed link and a non-delayed link are different. Third, the possible importance of differences in polarities are related to either positive or negative effects, hence $\gamma = 2$. Fourth, in System Dynamics, the difference between the polarities of two identical links does not depend on other attributes, e.g., their strength; therefore, $\delta = 0$. And finally, only positive and negative polarities are possible, so $\epsilon = 2$. With this parameter configuration ($\alpha = 1, \beta = 2, \gamma = 2, \delta = 0, \epsilon = 2$), Schaffernicht and Groesser (2011) obtain the distance ratio specified for the application of System Dynamics, which they called generically: Element Distance

Ratio (EDR). Equation 3.21 expresses the degree of difference between two models at the level of variables and links including polarity and link delays:

$$EDR(A, B) = \frac{\sum_{i=1}^p \sum_{j=1}^p diff(i, j)}{2 \cdot (\nu^2 - \nu - 2 \cdot (\nu_{uA} \cdot \nu_{uB}))} \quad (3.21)$$

SD scholars have showed that a positive correlation exists between the number of feedback loops of an individual's mental model and the degree of dynamic thinking of this individual (Booth-Sweeney and Sterman, 2007). In explicit models of SD models, feedback loops are represented at a higher level of description. Hence, Schaffernicht and Groesser (2011) suggest to compare the loops of both models which correspond to each other. This requires a semantic matching of the feedback loops. This semantic assessment accounts for the content of the loops which cannot be captured by a formal method. It considers the content which the loop captures, i.e., the causal mechanism it represents. The human coder decides if two loops correspond to one another, which makes the matching depend on the competences and knowledge of the coder. Unless a formalized procedure for this process is developed, it remains a step where careful and explicit reasoning is required' (Schaffernicht and Groesser, 2011:61).

Basically, the result of the semantic matching is the set of paired feedback loops between model A and B which are common l_c . In cases where no correspondence between loop of model A and loop of model B , the maximum loop distance is assigned. The correspondences of the feedback loops can be represented as a quadratic matrix L with $k \times k$ elements, using indexes m and n to refer to rows and columns, respectively. From matrix L , they derive the Loop Distance Ratio, $LDR(m, n)$. This ratio indicates the degree of difference between a pair of loops. It is a number ranging from $[0]$ (identical) to $[1]$ (completely different). For loops that are only elements of model A or B the value of the cell $l_{mn} = 0$,

and therefore $LDR(m, n) = 1$. On the other hand, if there are two corresponding loops, the $EDR(m, n)$ is calculated using the difference in polarities of these loops, $lpold(m, n)$, and their difference in delay $ldd(m, n)$. If the feedback loops m and n have the same polarity, the $lpold(m, n) = 0$; otherwise if the $lpold(m, n) = 1$ indicates a different polarity. Considering delay effects, the term $ldd(m, n) = 0$ if both loops are equal in delays, and [1] otherwise. The weights of the different terms are given by η , ι , and κ ; with $\eta + \iota + \kappa = [1]$. Equation 3.22 formalises the Loop Distance Ratio, $LDR(m, n)$ as follows:

$$LDR(m, n) = \eta * ldd(m, n) + \iota * lpold(m, n) + \kappa * EDR(m, n) \quad (3.22)$$

The distance of the set of all feedback loops is defined by Schaffernicht and Groesser (2011) as the Model Distance Ratio, $MDR(A, B)$. From a SD perspective, two models are identical if they have a $MDR(A, B) = 0$; the models are perceived to be *similar*, if $0 < MDR(A, B) < 0.25$; both models are dissimilar if $MDR(A, B) > 0.25$. The model distance ratio is the simple average of all distance ratios (Equation 3.23):

$$MDR(A, B) = \frac{\sum_{l=1}^n LDR(m, n)_l}{n} \quad (3.23)$$

3.3.7 Protocol of the facilitated modelling process

Management literature is rich in descriptions of ways to elicit a mental model (Eden et al., 1992; Groesser and Schaffernicht, 2012). Particularly in SD, several protocols have been used to depict a representation of a problem (Doyle and Ford, 1998; Plate, 2010). Such variety of protocols has emerged as a consequence that Forrester (1961) did not make explicit what a mental model contains (Schaffernicht and Groesser, 2011). As I suggested in Chapter 2, the analysis of the CEO's decision-making is under a resource-based view paradigm (Kunc and Morecroft, 2010). That means I investigate the variation in resource

accumulation and implementation of internationalisation strategies using SD modelling. Figure 3.4 shows the designed protocol for supporting the internationalisation strategy of small organisations which contains four steps:

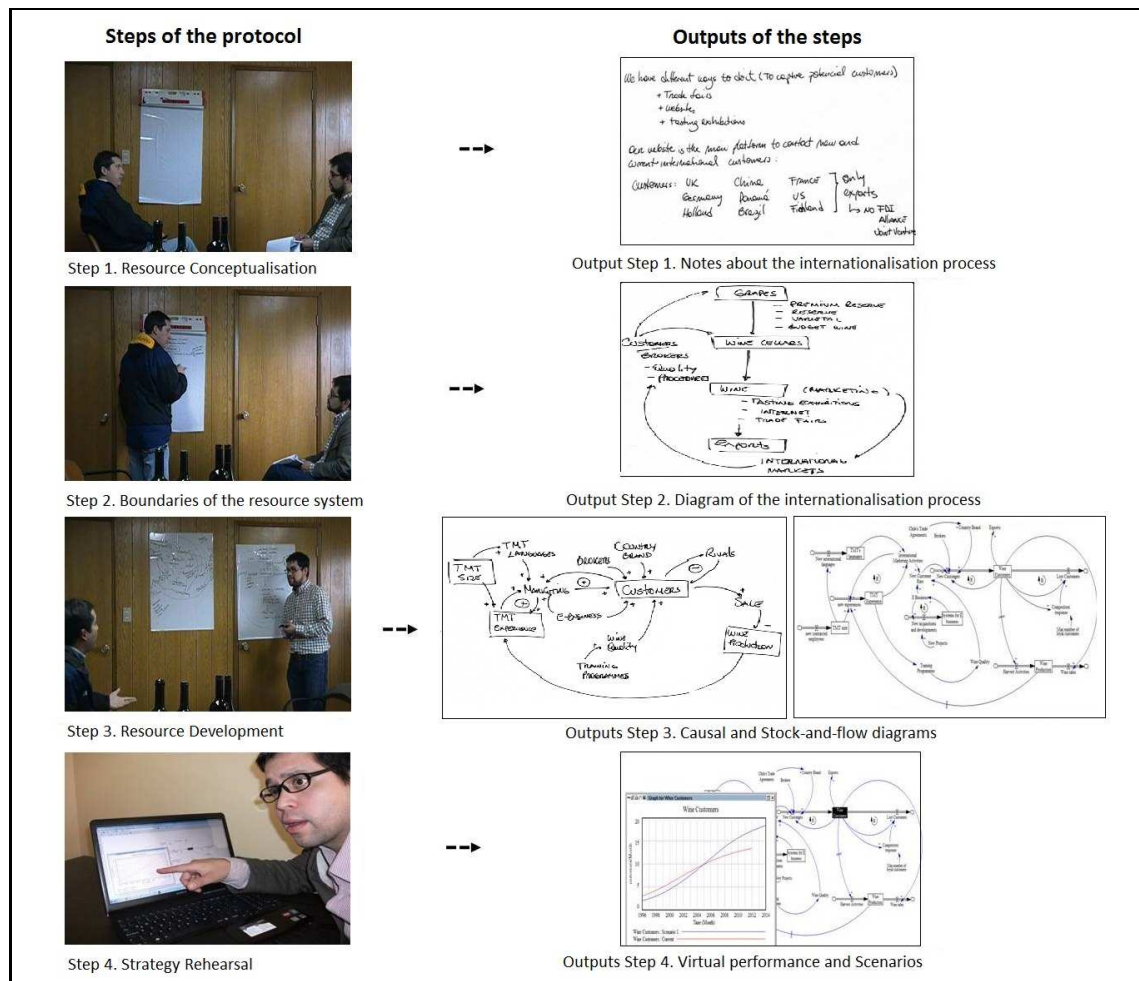


Figure 3.4: The facilitated SD modelling protocol for supporting the internationalisation strategy of small organisations

First Step. Here, questions are oriented to gather information firstly about the strategy process (how do they actually export?) and then about the resources that could be identified within the process. Tape and video recordings were employed in the meetings that should take between 90 and 180 minutes. As a practical illustration, I started the meeting with the same question in each case which was *how has your company devel-*

oped its internationalisation process? This general question allowed me to explore the CEO's understanding of the internationalisation process. Notes were especially useful for analysing this step, because they ensured the CEO could reflect on and draw conclusions from his/her description of the strategy process (See Step 1 in Figure 3.4). Also, notes enabled me to guide the conversation towards gathering relevant information that would support subsequent improvement of the strategy process.

Second Step. Once the CEO had described the internationalisation process, the second step was to recognise those resources perceived by him/her as relevant for the internationalisation process. Using notes made in response to the CEO's answers, I asked him/her to draw his/her conceptualisation of the strategy process described previously. This situation was mapped through a picture of the internationalisation process (See Step 2 in Figure 3.4). Drawing a picture of the process is one way to understand the problem situation and express it through diagrams. These diagrams can be interpreted as a preliminary mental model of the situation (Checkland and Scholes, 1990). Although the facilitator often establishes the initial structure and content of the picture, in this case I left CEOs to express his/her best representation of the internationalisation process. The intention of drawing an initial picture was to make sure the participants were familiar with the essential elements of the internationalisation process. Diagrams provide a framework in which individuals can think about the internationalisation process by linking a series of concepts that allowed the build-up of the mental representation of resource systems. This approach allowed CEOs to articulate different ways for expressing their understanding about how to gather and process relevant information.

Third Step. I asked CEOs to identify the resources perceived by him/her to be relevant during the earlier steps. Here, my role was to capture and structure thinking regarding:

(1) The nature of existing relationships between strategic resources and potential drivers for those resources (with arrows and polarities), (2) Potential feedback processes and delay effects only if the CEO suggested them previously, and (3) Alternative worldviews for simulating resource system maps about potential scenarios and other strategic resources which were not considered in the first conceptualisation. When a mental map of the resource system is relatively complex in terms of the number of strategic resources, factors, influences, and time delay effects, causal patterns help to indicate emerging characteristics from the structuring process in which the CEO conceptualises his relevant resources to implement a strategy (Morecroft, 2007). In practice, this step was divided by three parts. Firstly, I asked the CEO to identify the strategic resources and their causal relationships. While the CEO was identifying and explaining these factors, I drew in a chart a preliminary causal map of the process identifying the resources using a rectangle (See Step 3 in Figure 3.4). Secondly, I drew the SD model exclusively using the CEO's preliminary causal map drawn in the session. Later, I analysed the robustness of the CEO's model using video and voice recordings of the meeting as well as secondary information collected in informal meetings. Finally, I presented the CEO the SD model developed using the software Vensim v5.7 without any kind of change. Here, I started to contrast the ideas which were not developed clearly. The CEO was able to change every part of the SD model and rename the variables. I did not change anything based on my perception of the process, because I wanted the final SD model to represent exclusively the CEO's mental model of the internationalisation process.

Fourth Step. Finally, once the CEO had agreed the system representation of his/her strategic resources, feedbacks, and time delay effects that lead his/her strategy process, I modelled the analytical relationships described previously. I introduced the CEO to the idea that a strategic resource can be considered as an asset stock (Dierickx and Cool, 1989).

Then I analysed the behaviour (simulated performance) that had emerged from the SD model (See Step 4 in Figure 3.4). I used historical data to build simulations. I discussed different aspects of the SD models with the CEO and created at least four future scenarios. This process motivated the CEOs to talk about the current strategy of internationalisation and its likely consequences. Thus the dialogue provided opportunities both for assessing strategic ideas and learning from simulated performance.

3.4 Summarising Relevant Concepts of Chapter 3

Table 3.4 summarises the relevant concepts of the research design developed in Chapter 3. The research design is divided into two strategies of inquiry: (1) an econometric analysis and (2) case study research. The econometric analysis attempts to answer Research Question 1: *What is the impact of the CEOs on the internationalisation processes of SMEs located within a developing country?* by performing a multiple regression modelling. Section 3.2 *Inquiry 1* showed the description of the databases that were used to perform Inquiry 1 (Chapter 4), the multiple regression modelling, and the constructs of analysis.

On the other hand, the case study research addresses research questions 2, 3 and 4: *How do CEOs of small firms manage their resources for implementing an internationalisation strategy?*, *How can SD modelling support the internationalisation strategy of small firms in practice?* and *Are the CEO's mental models of the same internationalisation strategy similar in those firms with similar resources?*. Section 3.3 details the selection of the case studies (e.g., LR, IW, CT, AF, and FT), the conceptual elements of the SD modelling, the method for comparing SD models, and the protocol followed to develop the facilitated SD modelling in small organisations.

Table 3.4: Research Design

Study	Chapter 3	Chapter 4	Chapter 5	Chapter 6	Chapter 7
Inquiry 1 (Econometric analysis)	Selecting database Defining the multiple regression modelling Defining constructs to test hypotheses	Testing hypotheses Analysing results Discussing implications for Inquiry 2			Discussing findings Chapter 4
Inquiry 2 (Case studies)	Selecting cases Defining the SD modelling Defining the method for comparing SD models Defining protocol		Writing individual case reports (5) Step 1 Resource conceptualisation Step 2 Boundaries of resource system Step 3 Resource development Step 4 Strategy rehearsal	Comparative study across cases Qualitative analysis Quantitative analysis	Discussing findings Chapters 5 and 6
Research Question (RQ)		RQ 1	RQ2 RQ3	RQ4	Developing policy implications

Chapter 5 shows the case reports of the facilitated SD modelling process performed to support the internationalisation strategy of five small organisations. Findings from Chapter 5 address Research Questions 2 and 3. Chapter 6 exhibits the comparative analysis of the SD models built by the five CEOs in order to address Research Question 4. Finally Chapter 7 discusses and develops policy implications of the doctoral research.

Chapter 4

Influences of CEOs during the Internationalisation of SMEs

4.1 Introduction

Chapter 4 analyses Research Question 1: *What is the impact of the CEOs on the internationalisation processes of SMEs located within a developing country?* by performing multiple regression modelling. Four hypotheses were tested by using data from 921 SMEs participating in the National Business Survey in Chile. Chapter 4 is organised as follows: First, the assessment of the four hypotheses introduced in Chapter 2 (Section 2.3.5) is tested using three multiple regression models. These models were discussed in Chapter 3 (Section 3.2.3). Then the results are presented, followed by the discussion of its implications for the case study research. Finally, conclusions are detailed at the end of Chapter 4.

4.2 Research Findings

Eleven constructs relating to the four hypotheses defined in Chapter 2 were analysed. These constructs measured the CEO's characteristics (e.g., tenure, education, and age) covered by this study, as well as the level and diversity of resources within the 921 SMEs. By considering the level and diversity of resources it is possible to control alternative explanations that can affect findings about the relationships between CEO's characteristics and export intensity – RBV theory emphasises that the firm's stock (resources) accumulation, and its resource diversity are sources of competitive advantages (Dierickx and Cool, 1989).

I ran Ordinary Least Squares (OLS) regressions to test three models as suggested by Sambharya (1996). Table 4.1 shows the regression results of the three models defined in Chapter 3 (all reported p-values used the conservative two-tailed t-test). Model 1 includes the set of control variables related to the level of resources. Model 2 includes the set of control variables related to the level and diversity of resources. Finally, Model 3 shows the effects of the full model including control variables and measures of CEO's characteristics.

4.2.1 Assessing Econometric Problems

For all models, I analysed statistics and tested econometric problems using the software SPSSv18. The *Inter-correlation Matrix* presented in Chapter 3 (See Table 3.2) details the means, standard deviations and inter-correlation for all variables of this study. Significant pair-wise correlations among variables suggested the possibility of multicollinearity and autocorrelation (e.g., Firm size(turnover) / Firm size(employees), Firm size(turnover) / Capital-intensity, Firm-size(employees) / CEO-educational-level, and CEO-educational-background / Alliances). Therefore, the analyses of the Variance Inflation Factor and the Durbin-Watson test were performed.

Table 4.1: OLS results

Predictor variables	Export intensity		
	Model 1 ($N = 921$) (β)	Model 2 ($N = 921$) (β)	Model 3 ($N = 921$) (β)
Intercept	0.057*	0.056*	0.082*
Control variables			
Resource accumulation			
Firm size (turnover)	0.124***	0.124***	0.109***
Firm size (employees)	-0.205***	-0.205***	-0.191***
Business localisation	-0.045	-0.045	-0.056
Communication systems	0.071*	0.071*	0.019
Capital intensity	0.095**	0.094**	0.093**
Alliances	0.027	0.025	0.027
Resource diversity			
Firm resource diversity ^α		0.003	-0.001
CEO variables			
CEO tenure			-0.085**
CEO age			0.006
CEO educational level			0.153***
CEO educational background			0.002
Adjusted R^2	0.059	0.058	0.081
ΔR^2	0.065	0.065	0.092
F	10.627***	9.108***	8.411***

Two-tailed P-values: * $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

^α The lower the score, the higher the resource diversity

Table 4.2: VIF values of the three OLS models

Predictor variables	Variance Inflation Factor (VIF)		
	Model 1	Model 2	Model 3
<i>Control variables</i>			
Firm size (turnover)	1.047	1.063	1.076
Firm size (employees)	1.016	1.016	1.033
Business localisation	1.042	1.061	1.072
Communication systems	1.068	1.068	1.292
Capital intensity	1.056	1.219	1.264
Alliances	1.019	1.236	1.243
Firm resource diversity		1.391	1.392
<i>CEO variables</i>			
CEO tenure			1.168
CEO age			1.179
CEO educational level			1.198
CEO educational background			1.189

Table 4.2 shows that the VIFs for independent variables in the three models ranged from 1.016 to 1.068 (Model 1), 1.004 to 1.069 (Model 2), and 1.008 to 1.196 (Model 3). Hence, multicollinearity was not a threat in the regression analysis (Marquardt, 1980). Furthermore, the Durbin-Watson coefficient was 1.947 (Model 1), 1.947 (Model 2) and 1.976 (Model 3); therefore, there is no problem of autocorrelation.

4.2.2 Analysing the OLS models

Model 1 analyses six control variables related to strategic resource level. In this model, *firm size (turnover)* ($p < 0.001$), *communication systems* ($p < 0.05$) and *capital intensity* ($p < 0.01$) relate positively to export intensity, and *firm size (employees)* ($p < 0.001$) relates negatively to export intensity. Firms with economies of scale and a large set of assets engage in intensive internationalisation processes to reduce the risks associated with only one market (Nadkarni and Perez, 2007). Even though this argument is commonly used for established multinational companies (MNCs), my results (*firm size* and *capital intensity*) extend this argument for SMEs exporting commodities. In developing countries,

the large availability of natural resources influences firms to export intensively their products thanks to the global characteristics of their industries and reduced national markets. However, international SMEs employ a combination of qualified workforce and mechanisation processes that allows firms to reduce the number of full-time employees necessary for production, compared with similar firms who are less export-oriented, in order to be more competitive in global industries. On the other hand, international SMEs leverage information and communications technologies to interact more efficiently with customers and suppliers. Communications technologies allow SMEs to understand the needs of new market niches worldwide (Zahra et al., 2000). For that reason, SMEs located within developing countries and with higher internet penetration can show higher export intensity. Communication technologies also provide opportunities for companies to establish a distinctive strategic position in international markets. For example, the Internet provides SMEs with a global platform for reaching potential international customers at a low cost. This is especially relevant within those global industries – such as commodities – in which customers may be distantly located from the producer.

When I control the effect of *resource level* and *resource diversity* (Model 2), *firm size (turnover)* ($p < 0.001$), *communication systems* ($p < 0.05$), and *capital intensity* ($p < 0.01$) relate positively to export intensity, and *firm size (employees)* ($p < 0.001$) relates negatively to export intensity, which is similar to Model 1. However, *resource diversity* was not a significant predictor of export intensity. Traditionally, several scholars have suggested that compared with MNCs, SMEs cannot afford to compete on tangible resources, and can only compete on intangible resourcefulness, that is, the ability of doing more with less (Peng, 2001). These results support Peng’s (2001) suggestions as successful international SMEs do not seem to need a set of diverse resources.

Finally, Model 3 shows the effects of CEO's characteristics on the export intensity of SMEs controlled by resource level and resource diversity. Control variables have the same effects as Model 1 and Model 2. In Model 3, *CEO tenure* relates negatively to export intensity ($p < 0.01$). Thus, Hypothesis 1 is confirmed. The result confirms that CEOs, who have managed their own business longer, tend to sell mainly to the local market since they perceive internationalisation processes as being too risky. Two reasons explain why more tangible risks are associated with long-tenure CEOs of SMEs from developing countries. Firstly, in order to export intensively, CEOs should understand continuously external market changes to find business opportunities abroad. For example, commodity-based exporters are constantly monitoring the situation in external markets where rival firms are located (e.g., weather conditions or socio-political problems that may affect a rival's production). However, long-term CEOs' past experiences tend to dominate their responses to environmental stimuli that frequently act against any kind of change or monitoring (Miller, 1988). Secondly, CEOs of export SMEs face delay in payments that long-term CEOs are more reluctant than younger CEOs to accept. By contrast, these results suggest that when CEOs have a longer tenure, they use the knowledge acquired by past experience for achieving a better positioning in the local market. Hypothesis 2 about *CEO age* was rejected ($p > 0.05$). Although studies are reported that younger managers are more likely to adopt riskier strategies when implementing other internationalisation strategies, such as foreign direct investment (FDI) (Herrmann and Datta, 2006), I cannot support this fact with this sample. I believe that willingness to take risks of exporting commodities is partially explained by the *CEO tenure* instead of *CEO age*. CEOs of SMEs exporting commodities need a large amount of funding for growth. Older CEOs can obtain these resources from previous ventures, banking loans, and their own funds. In contrast, younger CEOs can obtain these resources from family loans for start-up and growth (Romano et al., 2001).

This counter-effect quite possibly affects CEO age as a predictor of export intensity.

On the other hand, the *CEO educational level* relates positively to export intensity ($p < 0.05$) supporting Hypothesis 3. Results suggest that CEOs with formal academic degrees have an international orientation. The level of education allows CEOs to develop greater cognitive abilities to manage complex situations (Escriba-Esteve et al., 2009) and, in this way, to be able to manage the internationalisation process, modifying products, services, and processes to access international markets (Fernandez-Ortiz and Lombardo, 2009). The fact that firms with academically stronger CEOs are more export-intensive supports the idea that many international small organisations are actually created to satisfy the needs of international customers by educated entrepreneurs.

Finally, Hypothesis 4 about the *CEO educational background* was rejected ($p > 0.05$). Escriba-Esteve et al. (2009) suggest that managers with higher levels of education would have greater abilities to face new international opportunities because they would be more open to modifying products, services, and processes in order to access international markets. Within the commodity industries, our study reveals that education leads to CEOs to be more open to exploring intensively their exports. However, the educational background of CEOs is not a significant predictor of export intensity. That is because many commodity-based firms are managed by CEOs who possess technical knowledge for the process of extracting commodities (e.g harvest, fishing or excavation), but their business expertise was developed in previous managerial experience rather than through formal educational training in *business studies*.

Findings from Chapter 4 suggest that the educational level of the CEO is an important characteristic which explains the export intensity of SMEs from a developing country. This evidence suggests that the CEO's learning achieved from formal education helps them to

improve the internationalisation process of small firms whose resources are not unique. Therefore, the evidence from 921 SMEs participating in the National Business Survey in Chile suggests the CEO's learning plays a central role in formulating and implementing internationalisation strategies related to the direct export in a developing country – the answer for Research Question 1. Additionally, the impact of the CEO's learning from formal education is relevant for validating the use of analytical reasoning supported by models (Dyson et al., 2007).

4.3 Implications for the Case Study Research

The abundance of natural resources (commodities) in developing countries is usually the main argument to explaining why SMEs, whose products and resources do not seem particularly unique, export intensively (Leonidou et al., 2007). In this context, scholars argue that commodity firms are mainly characterised by demand and supply factors (Henderson and Phillips, 2007). However, Chapter 4 showed that the CEOs' education is also particularly relevant for explaining export intensity. CEOs who developed capabilities from formal training, in companies that do not seem endowed with particular idiosyncratic resources, export intensively. This result provides evidence of the role of the CEO's dynamic capabilities (Adner and Helfat, 2003) in shaping competitive advantage in internationalisation processes of SMEs in developing countries. This is relevant for the development of the case study research because it suggests that formal education changes CEO's mental models of internationalisation.

CEOs of international firms face complexity, uncertainty, and excess of information during internationalisation (Nadkarni and Perez, 2007). That is because CEOs cannot comprehend all relevant stimuli and available information for making strategic decisions (Hambrick

and Fukutomi, 1991). With such problems, the new markets that CEOs face are causally ambiguous (Powell, Lovallo and Caringal, 2006). That means CEOs find it difficult to make sense of the causal relationships between their decisions and their organisational outcome. In this context, CEOs who are affected by cognitive limits and biases do not have a perfect foresight about how the environment behaves, what options and resources are available, and how the organisation should be run (Hodgkinson et al., 1999). Formal education, either from a college degree or an external consulting, can allow CEOs to deal with and overcome such difficulties. Moreover, knowledge acquired as a consequence of formal training can guide CEOs in making consistent analyses which link internal resources and potential opportunities abroad (Grant, 2008).

On the other hand, formal training allows managers to reflect upon what may be causing performance problems and to take appropriate corrective action to solve it (Kunc and Morecroft, 2010). However, when a systematic attempt at redirecting a strategy has been tried without result, OR/MS tools can make clear to the CEO what the consequences will be of continued failure in the strategy process (Dyson et al., 2007). However, this understanding of potential failures should emerge from a dialogue with CEOs supported by models rather than from the output of a model developed externally. Hambrick and Mason (1984) suggest that managers notice the information that is interesting or valuable to them. Hence, the learning from models developed by CEOs can trigger changes in their mental models intentionally. Although these suggestions offer potential benefits for CEOs, they also offer some threats for the CEO's learning. The results of Chapter 4 suggest that long tenure is negatively related to export intensity. In this context, CEOs develop habits that rely on past experience rather than new stimuli (Katz, 1982). This fact increases the willingness of using only the information source perceived by the CEO as relevant for strategic choices (Nelson, 2003). Hence, some external advice can be followed

and others not. This can lead CEOs to have different strategic insights in situations when similar resources are used (Gavetti and Levinthal, 2004). Therefore, the case studies should include firms in which CEOs have similar tenure years.

4.4 Summary of the Key Findings of Chapter 4

Chapter 4 has shown that the CEO plays a relevant role on the export intensity of small firms located within developing countries (Research Question 1). Although previous studies suggest the important of CEOs on the firm's strategic vision and performance (Escriba-Esteve et al., 2009; Van Den Heuvel et al., 2006), when resources are not unique and limited, the formal education of CEO seems to be a cause of heterogeneous performance among international SMEs. This source of CEO's dynamic capabilities gives firms a competitive advantage over competitors in their target markets. Results of this chapter suggest that the export intensity of SMEs is positively influenced by the level of academic achievements of CEOs. SMEs with highly educated CEOs exhibit higher export intensity because these managers are able to identify key resources to pursue new market opportunities. In contrast, the length of the CEO's tenure affected the export intensity of SMEs negatively. This finding provides evidence that in developing countries, long-tenure CEOs tend to sell mainly to the local market because: it is attractive to sell in the local market; the consolidation of SMEs in the local market is significant; or simply CEOs become more reluctant to take risks. When small firms are distantly located from the customers, which is the case of Chilean firms, CEOs can perceive internationalisation processes as being too risky because international markets can exhibit problems of logistics, payments, and social conflicts. Moreover, these results highlight that through formal learning, CEOs really change their mental models about internationalisation. Therefore, by the use of modelling and simulation, CEOs of small firms can be encouraged to improve and expand

their mental models of their current business status. They can develop corrective actions intended to close observed gaps between desired and actual resources, as well as structure internationalisation strategies prior implementation. The most valuable learning is that which CEOs learn from their own actions (Senge, 2006).

Chapter 5

Supporting Strategy Development of Small Organisations

5.1 Introduction

The aim of Chapter 5 is to address Research Question 2: *How do CEOs of small firms manage their resources for implementing an internationalisation strategy?* and Research Question 3: *How can SD modelling support the internationalisation strategy of small firms in practice?*. The SD models developed by the CEOs show how they perceive and manage the firm's resource system in implementing an internationalisation strategy. The description of the causal structures of the firm's resource system (e.g., variables, links, feedback, and delay effects), and the analysis of potential scenarios from simulations (behaviour) helped CEOs to stimulate their critical thinking related to the internationalisation process. Simulations of SD models provided the CEOs with a tool for rehearsing strategic initiatives and learning from virtual performance. The rounds of meetings started in August 2010 and finished in December 2010 for all firms.

Chapter 5 is divided into five sections. Each section describes the modelling developed for supporting the internationalisation strategy of LR (wine firm), IW (wine firm), CT (fruit firm), AF (fruit firm) and FT (fish firm). Individual reports are details in sections 5.2 (LR), 5.3 (IW), 5.4 (CT), 5.5 (AF), and 5.6 (FT). Each section details how the four steps of the protocol presented in Chapter 3 were performed (e.g., resource conceptualisation, boundaries of resource system, resource development, and strategy rehearsal). Additionally, some sections include quotations from CEOs during the modelling process. The quotations were not used to perform a narrative analysis, but they were used to support and supplement some particular descriptions of the modelling's steps. Finally, conclusions are presented at the end of Chapter 5.

5.2 Supporting the Internationalisation of LR

The modelling of LR case focused on supporting the CEO's understanding of the strategy process related to internationalisation. In 2007, Juan proposed to shareholders a plan to progressively increase the number of international markets while retaining the current ones. Figure 5.1 displays a strong growth of markets in the last three years. Even though sales fell during 2008—2010, the average price for wines increased continuously. During 2011, Juan's strategy of expanding the number of markets was successful. However, Juan wanted to implement a strategy to increase the number of customers located within these markets. In the section below, the individual case study report of LR is presented. This report shows the four steps of modelling in this wine company: (1) Conceptualisation, (2) Definition of resource system, (3) Resource Development, and (4) Rehearsing Strategy.

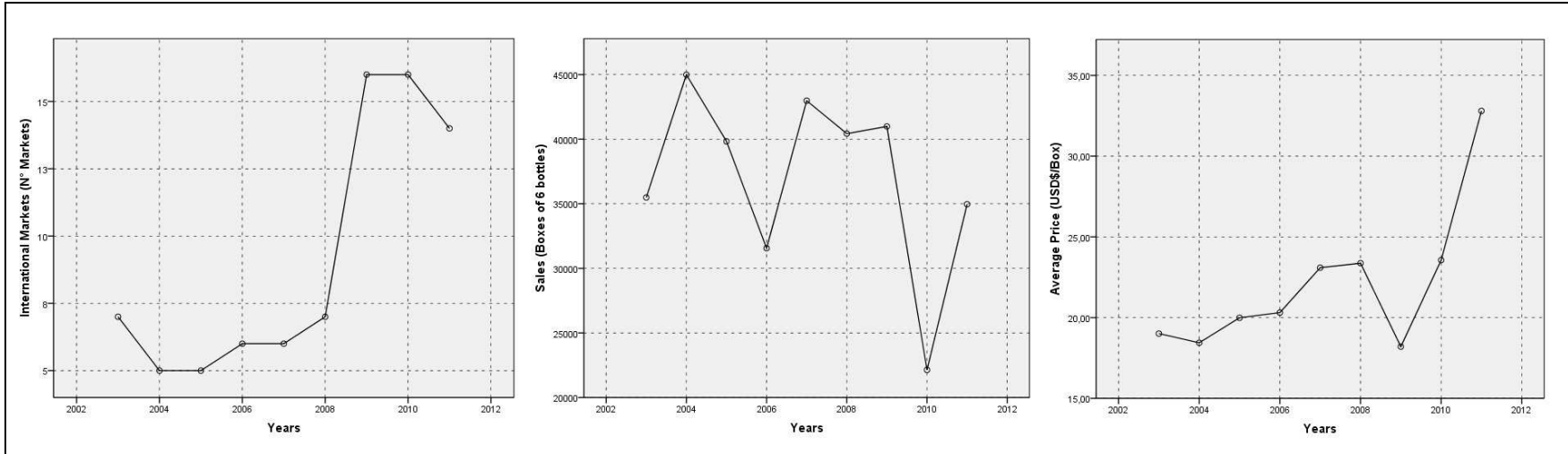


Figure 5.1: The LR's statistics

5.2.1 Conceptualisation Process at LR

I started the meeting by asking the CEO: **how has your company developed the internationalisation process?** This general question allows me to grasp the CEO's degree of understanding about the process. The conceptualisation step took up around one hour of the first meeting.

According to Juan, the successful internationalisation of small wine companies depends on two critical success factors: *wine quality* and *branding*. At LR, there are four different levels of quality: budget wine (*granel*), varietal (varietal), *reserve* (*reserva*) and premium reserve (*icono*). Even though quality depends on several factors, such as time, storage (*guarda*), terroir, and grape quality, the wine-maker's skills and experience are crucial factors for differentiating quality levels and customer's preferences. The wine-making process is similar for all varieties of wine. Red wine varieties are made with red grape varieties and white wine varieties are made with green grape varieties. For both kinds of wine, the wine-making process is divided into three steps: (1) harvest and selection, (2) crushing, fermentation, and lab test, and finally (3) filtration and bottling. However, complexity arises when some international customers have different standards to measure wine quality. For example, some markets want strong tasting wines rather than milder ones.

Quotation N 1

'During the negotiation with a new and large international customer, I (wine-maker) investigate whether the firm's current wines satisfy the customer's taste. If a project is attractive, I can either modify an existing wine or create a new line of wines that meet the new customers preference'

In Quotation 1, the modification of the product has to be implemented at least one year prior to making the new wine, because harvest happens only once a year. Although this is in most cases a *trial-and-error* process, it remains as one of the drivers of the wine quality. Figure 5.2 shows the process of planting a new variety of grape.



Figure 5.2: Planting a new variety of grapes at LR

LR focused its brand management efforts on achieving international standards (ISO9001), modifying branding labels (on the bottles) and packaging. Additionally, it teams up with other small Chilean wine groups that export, using a cluster strategy – competing but sharing marketing cost in international markets.

Quotation N 2

‘We try to focus on the needs of our customers (what they want) [...] **for promoting our products in international markets** [...] this implies, for example, variety of grapes as well as size and style of bottles’.

I asked the CEO to expand on his answer (Quotation 2) to the first question and discuss the firm’s promotion strategies in international markets. Several of the themes that emerged from the answers to the first question were somewhat diversionary, for example: the history of the organisation; the stimulus for producing wine; and the problematic situations related to currency exchange. I therefore had to guide the conversation to focus on the strategy process. Regarding the last question the CEO said:

Quotation N 3

‘We have different ways to do it [...] trade fairs, websites, and tasting exhibitions are our marketing activities that allow us to access (or reach) our customers [...] our website is the main platform to contact new and current international customers [...] in our international markets, especially in developed countries, we have many rivals [...] and if we do not produce wine other competitors will capture our customers’

The CEO’s answer (Quotation 3) revealed that LR uses a simple internationalisation process. They contact customers and then internationalise their products through exports. When I asked about LR’s other internationalisation strategies, the CEO responded:

Quotation N 4

‘Even though, I know there are other internationalisation strategies such alliance or joint venture [...] I haven’t considered them yet [...] My internationalisation strategy is simple [...] I look for customers in trade fairs, websites, and tasting exhibitions, then I sent examples of my wines; and if they like the samples, we agree a meeting. [...] Usually when are large customers or international brokers (customers able to buy large quantities of wine) these meetings are here (headquarter) and I show the wine-making process and the vineyards’

Quotation 4 shows the CEO recognised the existence of other internationalisation strategies, however he is not interested in implementing them. Also, this quotation suggests that the CEO’s perception of the resources which are able to implement an internationalisation strategy lead him to select some resources and rule out others. This could explain why there is such variety in the resources identified by scholars to be used in the SME internationalisation (See Table 2.4 of Chapter 2).

5.2.2 Boundaries of the Resource System in LR

The second part of the meeting analysed the boundaries of the resource system perceived by Juan to be relevant for implementing an internationalisation strategy. I mapped this situation through a sketch of the internationalisation process. Sketching the process is one way to understand the problematic situation and express it through diagrams. This visual approach allowed the CEO to articulate different ways of expressing his understanding about how to gather and process relevant information. Also, this approach allowed the CEO to connect the preliminary mental model and the process of modelling using SD.

In order to connect the first step with the description through diagrams, I asked Juan to draw the process on a chart. While Juan was drawing the picture, I simultaneously explored the potential strategic resources perceived by him by repeating questions from Step 1. When I asked Juan again about his company’s product promotion strategies in

international markets, he outlined the steps mentioned in Quotation 3. Juan did so with ease while drawing the picture. Figure 5.3 shows that the CEO recognised that one of the central focuses of exports is to reach new ways for attracting people to taste wine when the company tries to penetrate either a new international market or a new segment within an explored market.

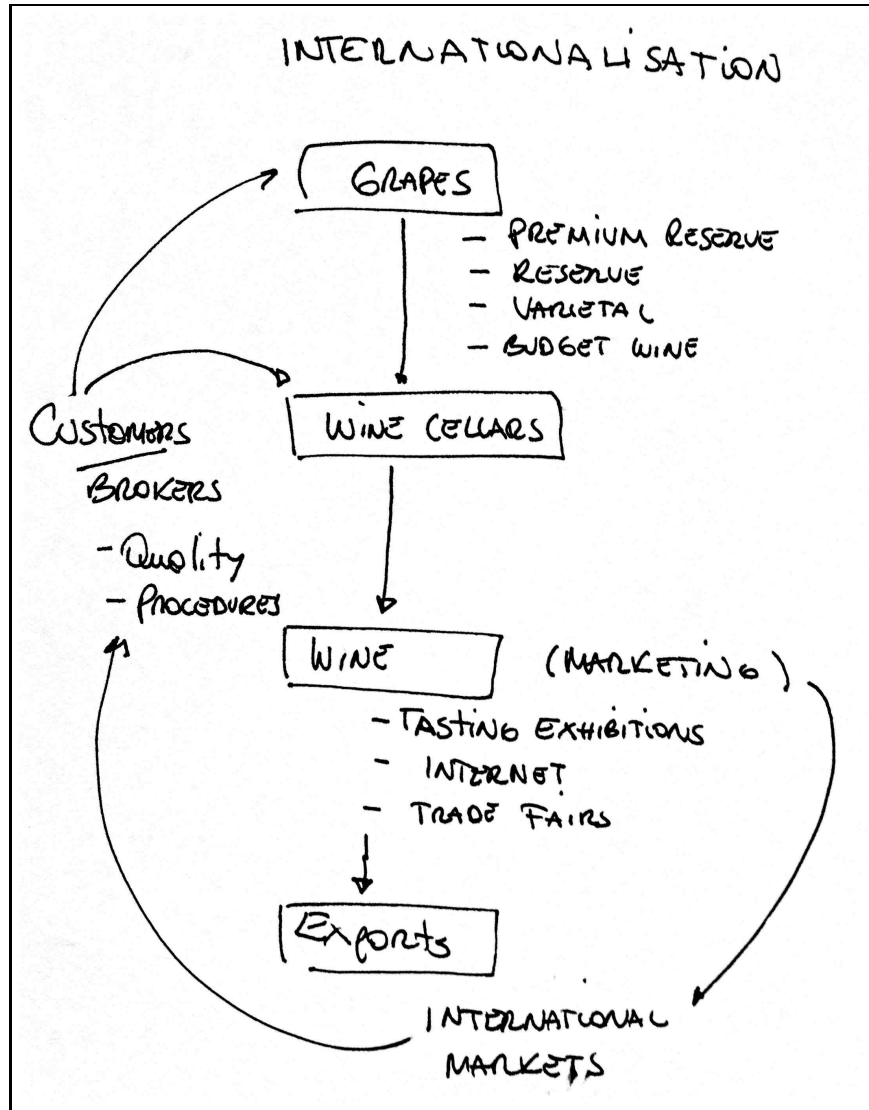


Figure 5.3: CEO's diagram of LR's internationalisation

Figure 5.3 shows that the CEO started to describe the sequence of wine production and finished with the description of the internationalisation. The CEO used a sequen-

tial diagram for depicting the internationalisation process rather than pictures or other forms of representation. This drawing exercise captured the processes behind the internationalisation, including wine-making, logistics, and customer relationship formation. Juan highlighted this exercise as an interesting process to describe the internationalisation sequentially (Quotation 5).

Quotation N 5

‘Drawing my production and internationalisation processes using a simple picture help me to explain you the process sequentially’

5.2.3 Resource Development in LR

Considering the following quotations of Juan, I illustrate the process of how the CEO identified potential strategic resources and their causal relationships. Here, resources are shown in **bold**, and their effects on the development of the other resources in *italics*.

Quotation N 6

*We have developed several marketing activities for looking for **customers** able to pay higher prices for our wines [...] However this task is not easy because it takes a long time [...] Thankfully, **Internet** provides a platform for making this search faster and cheaper [...] but you have to *train people to acquire new skills (e-business capabilities)* and buy the **necessary systems (Systems for e-business)** for *contacting customers and making agreements (e-business)*[...] (however) you must always pay attention what (activities) your rivals are developing to reach customers.*

Quotation 6 mentions two main resources: **Customer Portfolio** and **Systems for e-business** (during the session Juan included internet as part of the resource system for e-business). Juan used the term *customers* to signpost one of the main resources. However, RBV scholars do not consider customers as a resource because customers are not productive

assets owned by the firm (Grant, 2008). Therefore, I decided to use the term *customer portfolio* in the SD model because this concept can be considered as an intangible resource.

Quotation N 7

‘External factors, such as *a stable democracy, transparent taxes (no corruption), good weather conditions, and Chile’s trade agreements* help us to internationalise our wines[...] however, some internal factors, such as **our experience** in exporting, **the language spoken**, and our technical and management’s characteristics are also important [...] *(as well as) international standards (ISO 9001) and our brand prestige* to capture **customers** in new and sophisticated markets’.

While the CEO recognised both external and internal factors that allow the firm to capture international customers, during the modelling (Quotation 7), he argued that stable democracy, transparent taxes (no corruption), and good weather conditions are attributes that all companies possess in Chile. These factors are thus part of the country brand. He added that the top management team’s (TMT) experience, the size and number of languages spoken are resources that distinguish a firm from its rivals.

Quotation N 8

‘It’s not frequent that the CEO has technical **experience** in making wine and an MBA [...] My **experience** affects the modes of internationalising and making **wine** [...] In fact, (my experience) also affects *the quality of our wine varieties to satisfy sophisticated customers*’.

In Quotation 8, Juan highlighted that the main driver of the firm’s success is the TMT’s experience, especially his influence in all aspect of the business model. Furthermore, the CEO indicated a reinforcing loop related to the TMT’s experience. When a wine firm increases its marketing activities to gain customers in an international market, it learns about the customer’s wine preferences, and as a result, the CEO increases his experience.

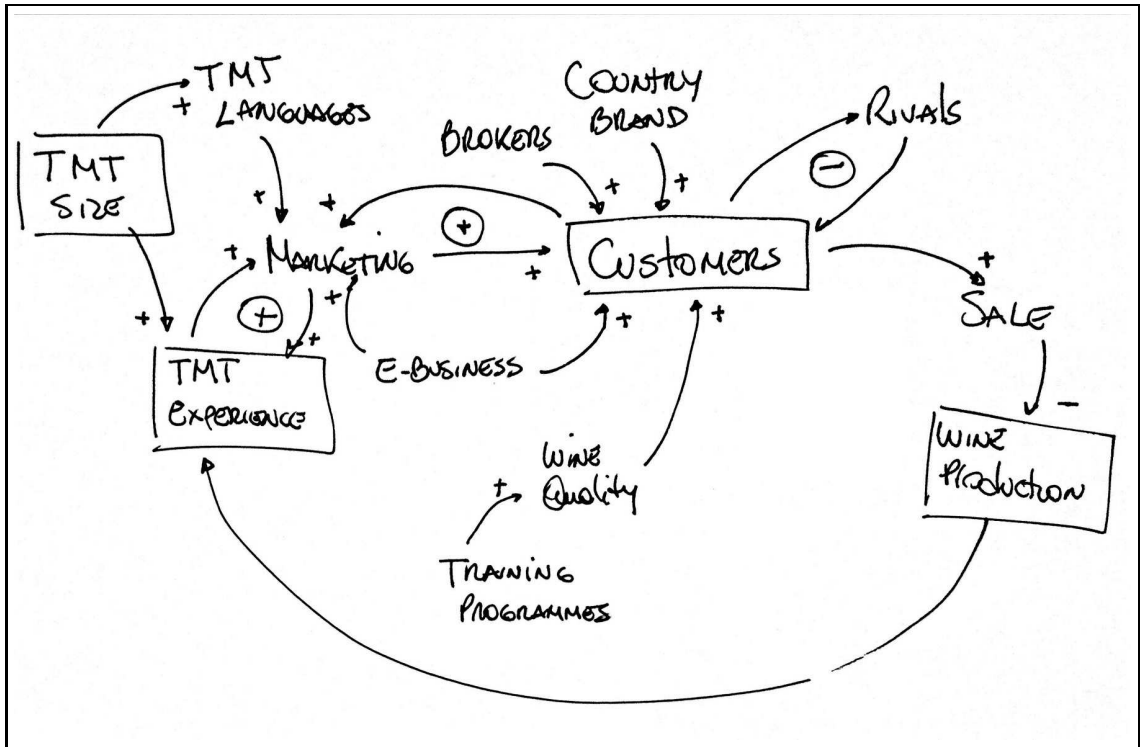


Figure 5.4: the CEO's preliminary causal map drawn in session

Figure 5.4 shows the CEO's preliminary causal map drawn in session during which the CEO identified six relevant resources: *Customer portfolio*, *Systems for e-business*, *Wine in production*, *TMT size*, *TMT experience*, and *Languages spoken by TMT*. During the follow-up meeting, this model was slightly refined, the central characteristics remained as shown in Figure 5.5. Figure 5.5 presents the final SD model developed in VENSIM. The connections (arrows) among variables, depicted here as dotted lines denote flows of information. The remaining connections are flows of raw. Both notations were developed by Morecroft (2007). Additionally, I included the polarity of these relationships and the feedback loops identified during the modelling process.

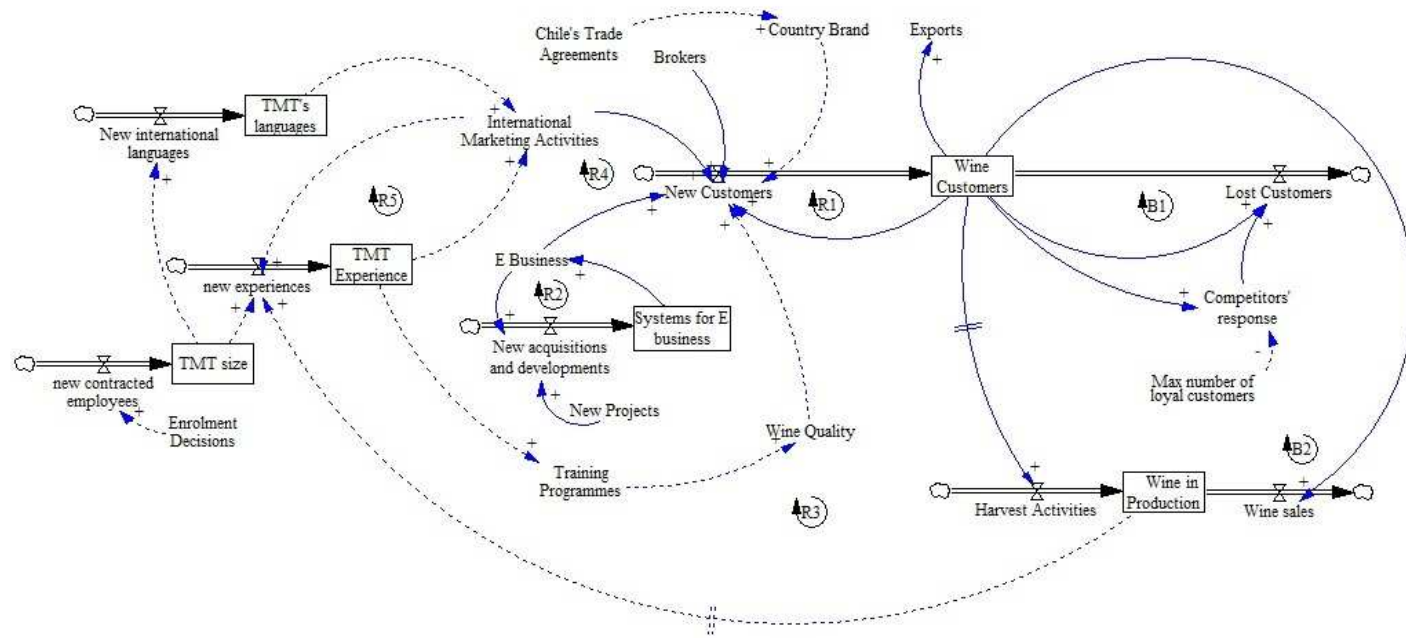


Figure 5.5: The CEO's view of the strategic resource system at LR using a SD model

The SD model explains how Juan understands the causal relationships among strategic resources (See Appendix C). For example, wine in production (W_t) for year t is increased if the customer portfolio in the year $t - 1$ increased due to marketing activities, e-business activities, improvements in the quality of wine, recommendations of other customers, or even improvements in the country brand (α_{nc}). Juan predicts the level of wine in production for next year (Wh_t) by adjusting the number of customers in the last year C_{t-1} to the mean of all historical customers' increments (ΔC_t). However, the wine in production (W_t) decreases if customer's response (Cr_t) is higher in year t ¹.

$$W_t = W_0 + \int_0^t (Wh_{t-1} - Cr_t)dt \quad (5.1)$$

$$Wh_t = (1 + \Delta C_t) \cdot C_{t-1} \quad (5.2)$$

$$Cr_t = \Delta wp \cdot C_t \quad (5.3)$$

Equation 5.1 is coherent with a dynamic Resource-Based View of the firm (Morecroft, 2007; Kunc and Morecroft, 2010) where the accumulation of resources is responsible for the performance of the firm. Formally, the dynamics of Customer Portfolio (C_t) have been modelled as follows:

$$C_t = C_0 + \int_0^t (nc_t - lc_t)dt \quad (5.4)$$

New customers (nc_t) and lost customers (lc_t) have been defined as:

¹I have simplified the modelling assuming that every customer buys the average amount of wine purchased historically (Δwp).

$$nc_t = \alpha_e b \cdot C_t + \alpha_m k \cdot C_t \quad (5.5)$$

$$lc_t = C_r \cdot C_t \quad (5.6)$$

Where $\alpha_e b \cdot C_t$ is the number of new customers who have been reached through e-business activities and $\alpha_m k \cdot C_t$ is the number of new customers who has been reached through marketing activities. Lost customers' dynamics depends on the relationship between competitor's responses (C_r) and the number of customers (C_t) (Equation 5.8). During the second step of the modelling, the CEO identified that rival companies' response can affect the customer dynamics. Although Juan did not have a clear idea of such effect, he suggested that this relationship was not linear.

Quotation N 9

'we have many rivals [...] and if we do not produce wine other competitors will capture our **customers**'.

Although Quotation 9 was consistent with Quotation 3, Juan's difficulties to explain the relationship between the rival companies' response and customers encouraged me to ask him how his rivals react when he has less production.

Quotation N 10

‘I have not a clear idea how they react when I have less wine in production. However, if I can’t fulfill with the agreed quantities of wine in production, [...] next year they won’t buy from us. [...] Also, this fact will affect our reputation [...] all Chilean wine firm’s CEOs know each other, so if they (rivals) know that I couldn’t fulfil our agreements, [...] they may use this against us saying to potential customers that we (LR) are not confident [...] (on the other hand,) problems with the unfulfilled agreements can affect our relationship with brokers’

In Quotation 10, Juan could not explain the relationship between production and its rival’s response. Hence, I formulated the following question: *hence, if you have one wine box less, how many customers can you potentially lose?*

Quotation N 11

‘I’m sorry but I have no idea [...] however, you can analyse the situation in this way, if I cannot fulfill the agreement once, you can lose some X customers, but if I do it twice, I will lose more than the double of these X customers’

Juan described *rival’s response* as the actions taken by rival firms as a consequence of unfulfilled agreements by LR. Therefore, I modelled rival’s response as a fraction per time period between the disaffiliated customers ($\beta_{lc} \cdot C_t$) and hypothetical maximum number of customers (τ). I used the look-up function available on VENSIM to model this non-linear first-order negative feedback relationship (Equation 5.7). I suggested that the wine company has a hypothetical maximum number of customers (τ) because the CEO indicates that there is no plan for increasing the production. Data used to create the look-up function was obtained from the CEO.

$$C_r = f(\beta_{lc}, C_t, \tau) \quad (5.7)$$

Finally, exports (X_t) were modelled as the mean of exports of an international customer (δ_{Xi}) multiplied by the number of international customers ($\gamma_i \cdot C_t$).

$$X_t = \delta_{Xi}(\gamma_i \cdot C_t) \quad (5.8)$$

5.2.4 Rehearsing Strategy in LR

The Base Case Simulation

This base case provided the CEO with a strategic picture of the internationalisation process with a consideration of the dynamics of resources over a set period of time. The LR base case simulation was produced over a period of 14 years (1996—2010). Numerical data were available for the period between years 2002–2010. Given the high dynamism of organisational plans within LR, it is unproductive to extrapolate too far into the future using simulations.

A strategically important part of the dynamics of the current customer portfolio (dotted line in Figure 5.6(A)) was the growth phase between 1996 and 2009. A combination of internal and external factors allowed the organisation to increase its customer portfolio. After 2009 a stagnation phase started during which growth ceased as a result of various consolidation measures. Since 2009 the company has begun a series of investments in new technology and marketing activities to reverse the stagnation pattern. In the base case, exports followed a slightly upward trend (dotted line in Figure 5.6(B)). On the other hand, TMT size growth (dotted line in Figure 5.6(C)) reflected the CEO's idea of hiring another manager for the new markets in 2012. However, real export dynamics showed some fluctuations (segmented line in Figure 5.6(B)) which were not predicted by the SD model. This difference between real and simulated data can open a discussion about the robustness of the CEO assumptions used to build the SD models.

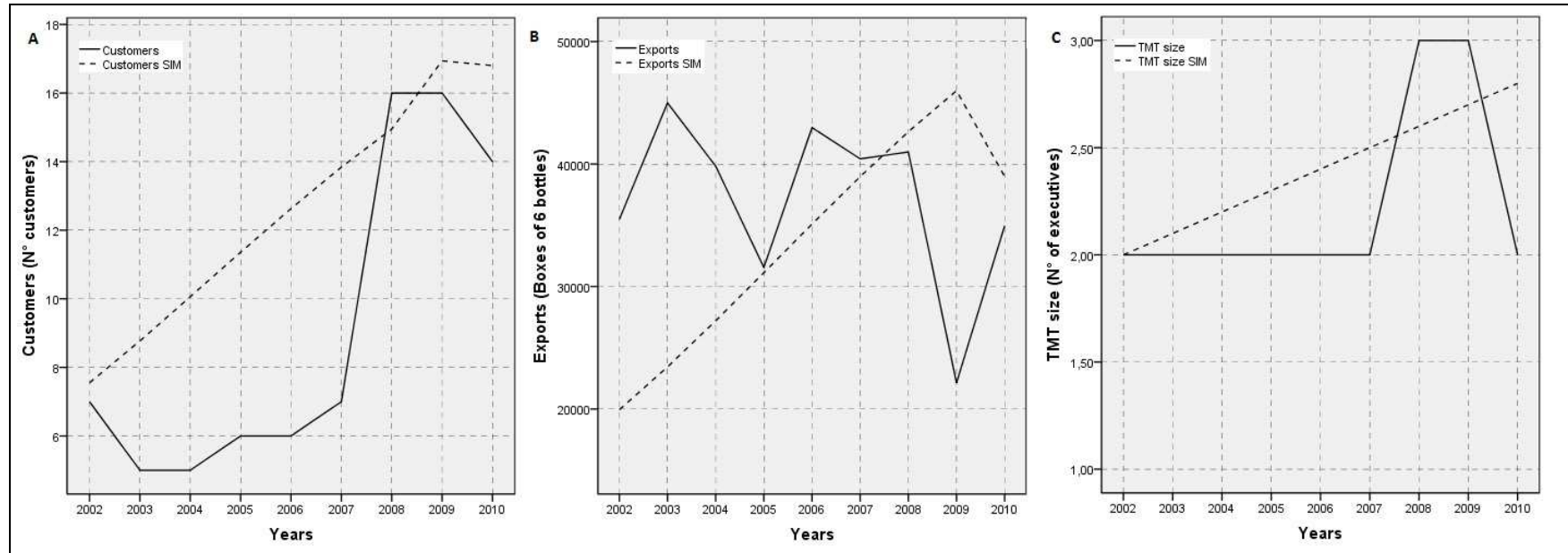


Figure 5.6: Historical fit for the three main variables at LR case.

In this case, lack of robustness indicates that the CEO did not fully understand the variables, links, loops, and parameters representing the export dynamics. Nonetheless, the approach of this dissertation was not to predict behaviour, but to learn about the consequences of actions and to assess strategic ideas which emerged from modelling.

Model Testing Procedures

Confidence in the model was gained by applying a series of recommended and accepted tests for system dynamics models (Morecroft, 2007). I applied two validations: *structure validation* and *behaviour validation*. Table 5.1 shows the statistics for validating the structure of the SD model developed by the CEO of LR.

Structure validation shows that variables and relationships are consistent with observations about the mental model of someone who knows a business well. In fact the match was good because the SD model was developed by the CEO.

Table 5.1: Statistics for assessing the SD model's structure validation for LR

<i>Description</i>	<i>Number of factors</i>
Number of variables in the model	23 variables
Number of variables introduced by the CEO	23 variables
Number of non real-world variables	0 variable
Number of variables with problems under extreme conditions	0 variable
Number of links in the model	32 links
Number of links introduced by the CEO	32 links
Number of delays in the model	2 delays
Number of delays introduced by the CEO	2 delays

In summary, all equations are dimensionally correct without the use of non real-world parameters (dimensional consistency), all parameters were suggested by the CEO (parameter verification), and simulations made sense under extreme conditions. In fact some scenarios which were used for rehearsing the internationalisation strategy shows well-dimensioned dynamics under extreme conditions. There was a good quantitative fit in the base case

Table 5.2: Statistics for assessing the SD model fit to data from LR case study

<i>Variable</i>	<i>MAE</i>	<i>MSE</i>	<i>Theil's inequality statistics*</i>			<i>R²</i>	<i>N</i>
			<i>Bias</i>	<i>Unequal variation</i>	<i>Unequal covariation</i>		
Customers	3.667	18.82	0.626	0.099	0.266	0.732	9
Exports	9,887	$16 \cdot 10^6$	0.065	0.021	0.910	0.366	9
TMT size	0.333	0.16	0.197	0.174	0.615	0.460	9

* The failure to sum to unity is due to rounding errors

which was consistent with the aim of SD modelling to reproduce the modes of behaviour (Taylor and Dangerfield, 2005).

Table 5.2 provides a number of historical fit summary measures, as described by Morecroft (2007). Note that while the R^2 is low for *exports* (Figure 5.6 (B)), it is significantly different from zero. Even though the mean absolute error (MAE) of exports is low (9,887 boxes), the SD model predicts an upward trend of exports rather than a downward trend. The unequal covariation explains that 91 per cent of the mean square error arises from point-by-point differences caused by the unexplained cyclicity in the data. Juan attributed the decline of customers to some increments in wine's prices. The simulated dynamic of exports was based on the idea of incrementing the number of customers (See Figure 5.6 (A)). The effect of price, which was not included in the model, could explain such differences between real and simulated data. On the other hand, considering that the SD model was based solely on the CEO's mental model of the internationalisation, the bias (overestimates) in customer portfolio (Figure 5.6 (A)) is moderated and can be attributed to the early underestimates of marketing activities rates². The dynamism of the TMT size has remained stable in the last 9 years. In 2012, Juan expects to hire one manager for local sales. The bias of the TMT size is 0.197. That means the 19.7 per cent of the MSE arises from the difference of means, reflecting the upward displacement of the simulated data points. Figure 5.6 shows the simulated and actual data for three key variables of the

²The information related to marketing activities was provided only for the last 3 years (2008—2010), therefore, it was not included in the analysis for assessing the model fit to data.

modelling developed at LR³.

Selecting Strategic Initiatives for Creating Scenarios

Table 5.3 shows the four strategic initiatives suggested by Juan for improving performance. Three initiatives emerged during the formal modelling sessions using SD (Steps 3 and 4), and only one initiative emerged from the descriptive analysis (Step 1). The initiatives show that Juan is interested in developing the firm's customer portfolio by increasing the marketing activities in target markets.

Table 5.3: List of strategic initiatives suggested by Juan during the modelling

<i>Strategic Initiatives in LR</i>	<i>#</i>	<i>Step</i>	<i>Description</i>
New label	1	1	To modify labels of wine varieties which identifies brand, wine variety, type of wine and harvest year (e.g., LR - Merlot - reserve - 2009). The idea was to use a specific name and logo for every wine variety without mentioning the type of wine.
Increase training	2	3	To increase the training of full time employees for improving the work environment.
Increase Marketing	3	4	To increment the number of marketing activities to reach more customers in new markets.
Develop customer service	4	4	To develop customer services (after-sales services).

During the simulation session, Juan wanted to analyse two initiatives regarding the Customer Portfolio. Figure 5.7 shows four scenarios in which Juan tried to draw conclusions about potential dynamics of strategy. Results of these four scenarios show that the potential positive outcome of the strategy only occurred in one of the four scenarios (quadrant 2). Customer's dynamics in the current or base scenario are shown as dotted line (all quadrants). Unclear scenarios (Quadrants 1 and 4) occurred when strategies between the

³These variables were identified by the CEO during the resource development step.

firm and its rivals were similar (e.g., high/low marketing activities and high/low responses from rivals). In these two scenarios, Juan could not infer any kind of initiatives. However, quadrant 1 offers a view on how Juan perceives the impact of his marketing activities when he faces difficulties with disaffiliated customers. When LR faces a higher level of unfulfilled agreements, the level of responses from rivals also increases. According to the simulation of this scenario, if LR pushes its marketing activities to attract more customers, the responses from its rivals are much more damaging in the long term. Therefore, the CEO should focus on understanding how he can improve the impact of marketing activities in the long term.

On the other hand, if the firm increased its marketing activities and rivals' responses were low, the number of wine customers increased over time (Quadrant 2). The dynamics in this scenario may look simple. However, when non linear behaviours emerge from simulations, the dynamics of customers are complex to analyse. For example, it is difficult to deduce that in the long term customer growth can enter in a stagnation phase in spite of LR's further expansion of marketing activities. This analysis can open a discussion on alternative ways of winning customers when marketing activities lose attractiveness.

To conclude, only Quadrant 3 showed a potential negative outcome of the strategy, in which the number of customers could be less than the current situation. Regarding the mental structure of the CEO, Juan perceives marketing activities as the most relevant source for increasing customers. This view suggests dependency on marketing activities as the only way for attracting customers. This dependency may discourage the firm from considering alternative strategies, such as improving the customer services (after-sales services) and developing innovations for differentiation.

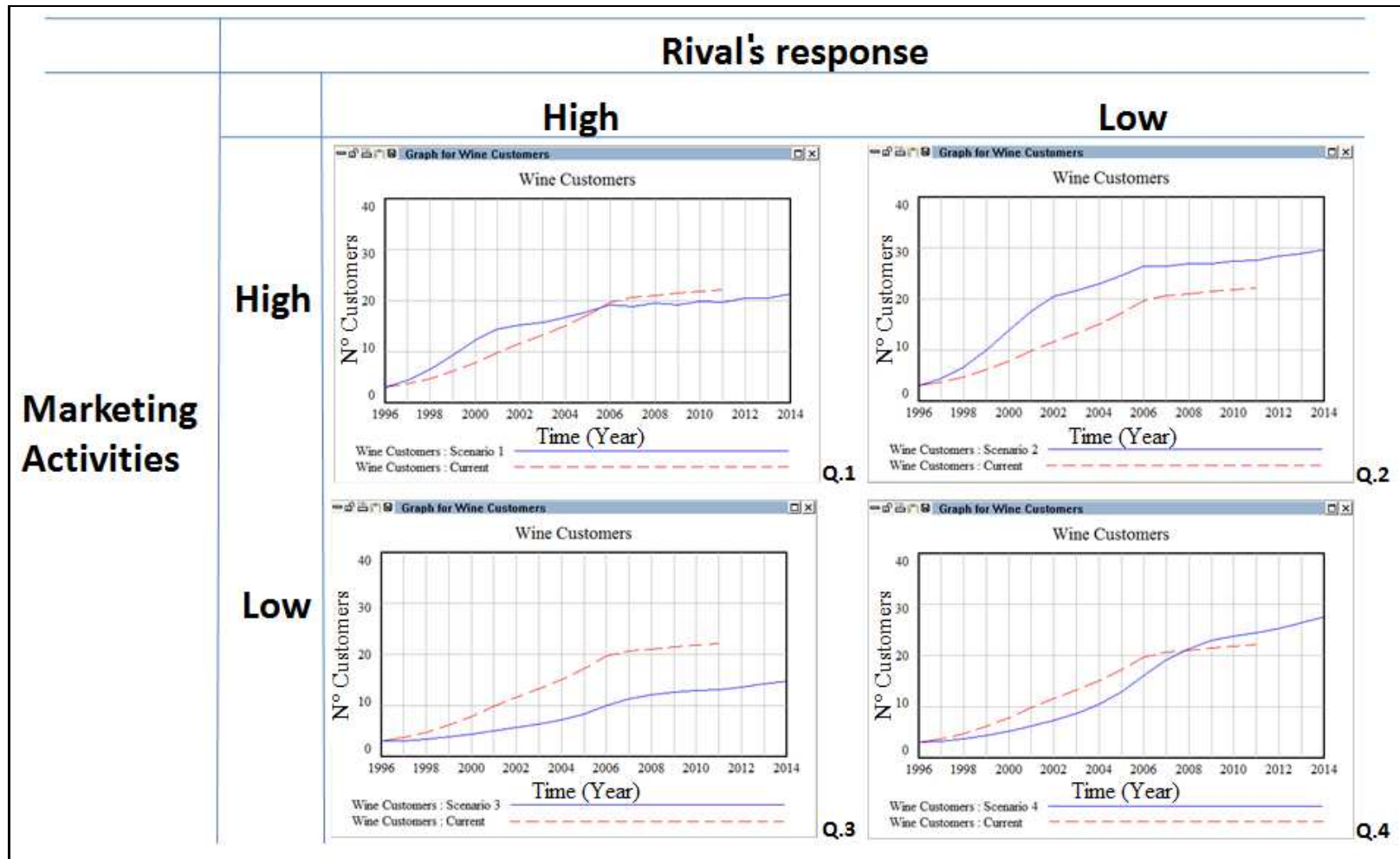


Figure 5.7: Scenarios showing potential heterogeneous performance depending on the strength of the feedback processes in LR

5.2.5 Evaluating the SD modelling in LR one year later

This wine company increased slightly the number of customers one year later from 16 to 18 which represented an increment of 12.5 per cent. However, LR increased the average price of a bottle of wine by 25 per cent, and increased the number of exports by 12 per cent this period. The CEO suggested that this increment in the number of customers was triggered by the marketing activities and the changes in bottles' labels. Both activities were aligned to the strategic goals related to expanding the company's activities in new markets.



Figure 5.8: *Mousai* is one of the new wine brands of LR

This company improved its website by showing (1) the different wine lines in an English version, (2) a link to Twitter and Facebook, and (3) the awards achieved in the last years. Currently, LR is working to open a wine museum to show how they develop the different wine varieties. On the other hand, the CEO created six new wine brands to position in

a different niche market. For example, Figure 5.8 shows one of the new brands which is called *Mousai*⁴. This new brand has seven wine varieties (e.g., Cabernet Sauvignon, Merlot, Chardonnay, Sauvignon Blanc, Syrah, Malbec, and Carménère varieties). In contrast, other brands have fewer wine varieties because are focused on premium segments of customers, such as the brand called Chaku which only has three wine varieties (e.g., Cabernet Sauvignon, Merlot, and Sauvignon Blanc). These brands attempt to satisfy the specific needs of each market related to the wine's intensity, colour, and smell.

The slight increase in the number of customers was predicted if the CEO developed more marketing activities (Scenario 2 of the LR case in Chapter 5). This suggests that the CEO developed the resources following the learning he received from the scenarios. Although the CEO argued that the development of a new brand was a strategic initiative created before the modelling, the use of simulation helped the CEO to anticipate the future using an analytical tool.

5.3 Supporting the Internationalisation of IW

In this company, Irene, the owner-CEO and wine-maker, started her own venture after 20 years of working for large wine firms. She participated in this doctoral project with interest because she wanted to receive a formal feedback on her current internationalisation strategy. I supported Irene in some strategic decisions related to the evaluation of increasing the participation in the retailers' customer portfolio. In the section below, the individual case study report of IW is presented. This report shows the four steps of modelling in this wine company: (1) Resource Conceptualisation, (2) Definition of Resource System, (3) Resource Development, and (4) Rehearsing Strategy.

⁴Information about new brands is available online: <http://www.laronciere.com/>.

5.3.1 Conceptualisation Process at IW

I started the meeting by asking the CEO: **how has your company developed the internationalisation process?** This general question allows me to grasp the CEO's degree of understanding about the process. The conceptualisation step took up around 45 minutes of the first meeting. This small wine company focuses on producing *author's wines*. That means to produce small quantities of a unique premium wine made by the company's owner (every bottle has a number and the year of harvest). Most of the wine's varieties have a limited production, and the distribution process is controlled by one specialist retailer (*Club de Amantes del Vino (CAV)* or Wine Lovers Club). However, Irene also selects some premium customers and independent wine merchants to sell her wines to specialised markets in the United Kingdom, United States, Canada, Belgium, Brazil, and Chile. The wine-making and storage processes take place within a small wine cellar close to Irene's home. She monitors the entire wine-making and bottling process, as well as the negotiation process with customers.

Responding to my first question, Irene commented:

Quotation N 1

'My internationalisation is based on my experience in advising large firms for 20 years [...] To export wine you must have the know-how of running a wine business [...] I know how to make wine, I know the current tendencies of wine demand, I know the process of exports, [...] for example, (in premium customer segments) customers visit my vineyard, later, they email me showing an interest in my wine. After that, I send wine samples and they (customers) can say whether they like it or they don't like it [...] If they like the wine sample, we arrange an agreement and I export the wine.

The IW internationalisation process is based on capturing potential premium customers through customer's recommendations and tasting exhibitions (Quotation 1). At tasting exhibitions, IW's wines have achieved prestigious awards. In 2008, the CAV awarded the

I-latina wine (Syrah variety) the title of the best Chilean Syrah of the year, as well as the best wine launch of the year. During 2009 and 2010, the IW's wine varieties placed in the top ten list of the CAV's Chilean ranking (www.lacav.cl). These awards allowed IW to attract and gain those customers who are able to pay higher prices per bottle. Figure 5.9 shows that in the last three years, IW has increased the number of markets, sales, and wine prices.

Quotation N 2

'We are a boutique wine company, [...] therefore, my model of internationalisation is to focus on sophisticated customer segments rather than massive ones [...] such as Tesco in the UK [...] at this moment, we are not interested in exploring other alternative ways of exporting our wines to such alliances or joint ventures'.

IW bases its international model on capturing sophisticated customers who are not reachable using traditional marketing activities, such as: internet sales, or magazine and TV advertising. In Quotation 2, Irene states that she is not interested in exploring wines through alliances or joint ventures, because the orientation of boutique wine companies is to sell wine to specialist retailers rather than massive ones. Reserve wines made by hand are not able for any retailer. This last point led into my next question related to the export process: *how do you sell wine in international markets?*

Quotation N 3

'I have a specialist retailer in each market [...] it's a partner, in Chile I have the CAV. [...] But it is not a formal alliance, [...] They (retailers) have a portfolio of premium customers and they play the role of intermediary between IW and the customers. [...] I select these specialist retailers to make sure my final customers are specialist wine stores or sophisticated restaurants [...] And a typical mistake is to produce cheap wine to low customers segments and then try to insert a premium wine. Customers don't want to pay a higher price when they know this wine company has budget wines'.

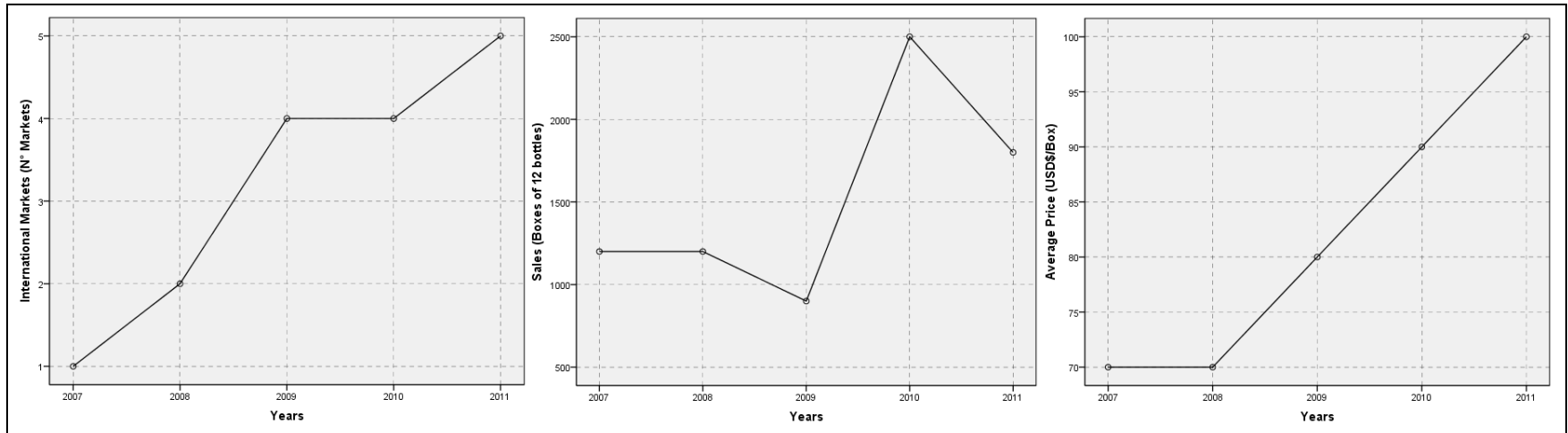


Figure 5.9: The IW' statistics

This kind of boutique wine company applies a strategy of customer segmentation (Quotation 3). The CEO only wants customers able to pay higher price for premium wines. Consequently, when specialist wine retailers accept to display a wine in their stores, they make sure that the quality is superior to the average wines, otherwise their prestige can be affected.

Quotation N 4

‘My wines have higher prices to the average Chilean wines because they have been awarded several times and have a superior quality’.

The differentiation strategy of IW is based on price and quality (Quotation 4). In developed and emerging countries, the wine industry can offer attractive niche markets with strong growth of demand, and abundant potential for differentiation. For example, some hand-made wines of rare grapes are highly sought after by specialist retailers looking for new wine varieties. For several years, this was the case of the Chilean Carménère, an old and rare French wine variety rediscovered by the French Jean-Michel Boursiquot in Chile in 1994 after 130 years of apparent extinction ⁵. With common wine varieties, such as Syrah, Merlot and Cabernet Sauvignon, wine makers must differentiate their wines in terms of quality and the perception of quality. Irene recognises that awards are an important factor for differentiating her firm from rival firms, because these are formal standards for measuring customer satisfaction with the wine’s quality. Figure 5.10 shows barrels of I-latina Syrah wine whose 2007 harvest obtained the best Chilean Syrah wine of the year 2008 award.

⁵more information: History of Carmenere, part 1 and 2, Concha y Toro Wine Magazine, available on www.conchaytoro.com.



Figure 5.10: Barrels of I-latina Syrah wine harvest 2010

5.3.2 Boundaries of the Resource System in IW

The second part of the meeting aimed to analyse the boundaries of resource system. This situation was mapped through a picture of the internationalisation process. This approach allowed Irene to articulate different ways for expressing their understanding about how to gather and process relevant information.

In order to connect the first step with the description through diagrams, I asked Irene to draw the process on a chart. While Irene was drawing the picture, I simultaneously explored the possible strategic resources perceived by her during the conceptualisation step. Figure 5.11 shows the picture of the IW internationalisation process.

In the first part of the description (superior side in Figure 5.11), Irene described that the Internet is the main platform for selling wines in Chile and abroad.

Quotation N 5

'In Chile, The 'CAV' and 'El Mundo del Vino (EMV)' are the most popular specialist wine retailers [...] I work with both because they sell wines in small quantities to wine customers [...] They buy my wines and advertise them in their wine magazine. For example CAV has 10.000 magazine subscribers and CAV sent them one or two bottles per month depending on the subscriber's plan [...] Both contacted me through my website [...] (also) Naked-wines, an online specialist retailer in the UK (<http://www.nakedwines.co.uk/>), used my website to ask me for wine samples'.

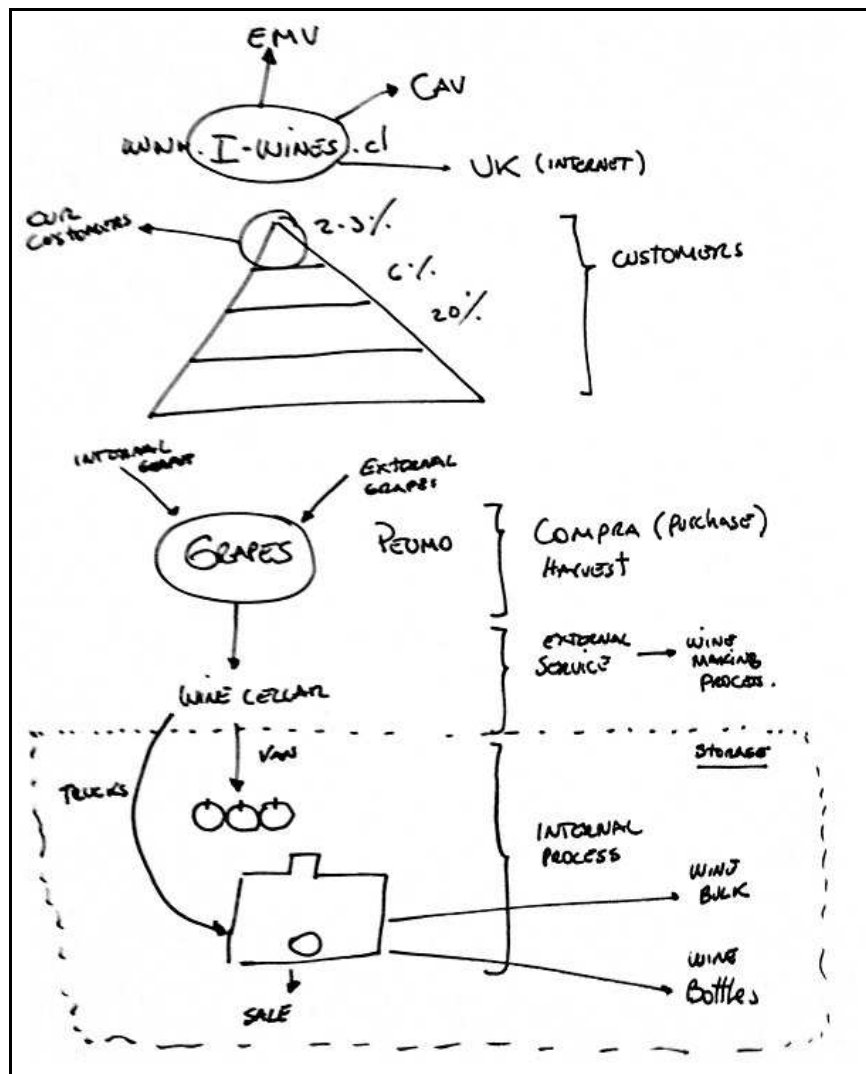


Figure 5.11: CEO's diagram of IW's internationalisation

Irene described the type of customers she wants to reach by drawing a pyramid (Quotation 5). Her company targets sophisticated customers who make up the top of the pyramid (3%) and who are able to pay higher price for hand-made wines (Quotation 6).

Quotation N 6

‘I don’t want to sell to Tesco or ASDA my wine [...] because when customers (top 3%) buy a wine in these supermarkets, then they don’t want to buy the same wine in a restaurant [...] hence, restaurants are not interested in these kind of wines (supermarket’s wines) [...] of course there are exceptions, such as Don Melchor (Concha y Toro premium wine)’.

Lastly, Irene explained that the production process is divided by two parts, (1) wine-making and (2) storing. In 2010 Irene produced her wines at an external wine company because she did not have all the required machines to produce the wine in her place. This outsourcing poses several problems related to deliveries and production capacity (Quotation 7).

Quotation N 7

‘Currently, I’m working as an external advisor of several wine companies. One of these companies allowed making my own wine using their machines [...] However, they mixed my wine in their store and this caused me several financial losses [...] I couldn’t control where my casks of wine were [...] problems with wine losses can cause me terrible problem with my customers [...] I’m a young entrepreneur with a little wine company, hence, I don’t have stocks for wine losses’.

5.3.3 Resource Development in IW

Considering the following quotations of Irene, I illustrate the process of how the CEO identified potential strategic resources and their causal relationships. Here resources are shown in **bold**, and their effects on the development of the other resources in *italics*.

Quotation N 8

‘**The CAV (specialist retailer)** is *fundamental for incrementing customers* [...] The CAV is a well-know specialist retailer in Chile [...] In Chile I sell wines exclusively in their stores (CAV) [...] **The CAV** awarded **my syrah** as the best syrah wine of Chile in the year 2008 [...] Awards attract new **customers** interested in premium wines’.

Quotation 8 mentions two main resources: **Customer Portfolio**⁶ and **Specialist retailers**. Irene shows that specialist retailers increase her customers through two ways: direct sales and mean advertising. Often specialist retailers publish their awards in specialist wine magazines. Wine magazines serve as a platform for reaching new sophisticated customers.

Quotation N 9

‘(In the last year) international **new specialist retailers** have visited me frequently [...] However, you have to act quickly and efficiently, if they ask you for wine samples, labels in pdf file or some recommendations, you must send them as soon as possible [...] For that reasons, *I am online most of the time* [...] to use **communication systems** is fundamental in this business’.

Quotation 9 stresses two other resources, *specialist retailers* and *communication systems*. Even though specialist retailers are not assets owned by the firm, the CEO perceives those which support the IW’s internationalisation process as intangible resources. Through retailers’ stalls and magazines Irene reaches potential customers who seek premium wines. Nonetheless, Irene also uses communication systems intensively for capturing customers. These actions combined have successfully boosted the number of customers in the last three years.

⁶Implications of Customer Portfolio as a resource were explained in the LR’s case study section.

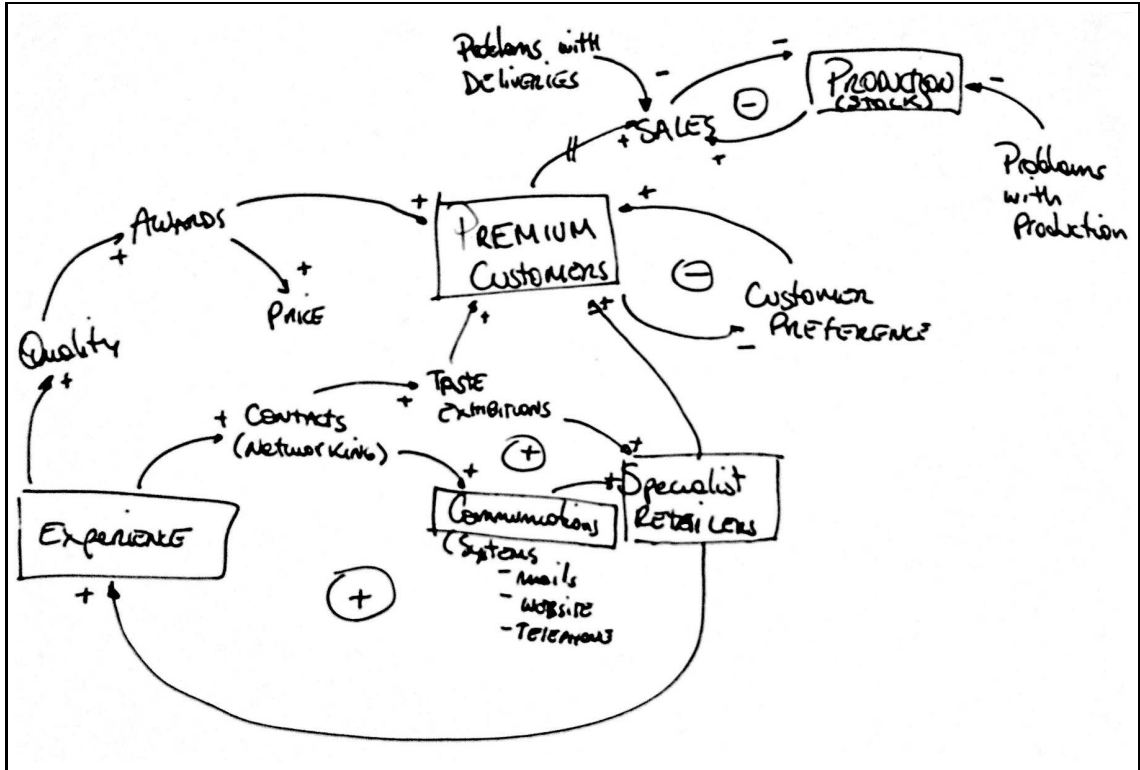


Figure 5.12: the CEO's preliminary causal map drawn in session

Figure 5.12 shows the CEO's preliminary causal map drawn in session in which the CEO identified five relevant resources: *Customer Portfolio*, *Communication Systems for e-business*, *Wine in production*, *Owner experience*, and *Agreements with specialist wine retailers*. During the next meeting, this model was slightly refined, however the central characteristics remained stable as shown in Figure 5.13.

Figure 5.13 shows the final SD model developed using the VENSIM software. Here, the dynamics of Customer Portfolio (C_t) have been modelled as follows:

$$C_t = C_0 + \int_0^t (nc_t - lc_t) dt \quad (5.9)$$

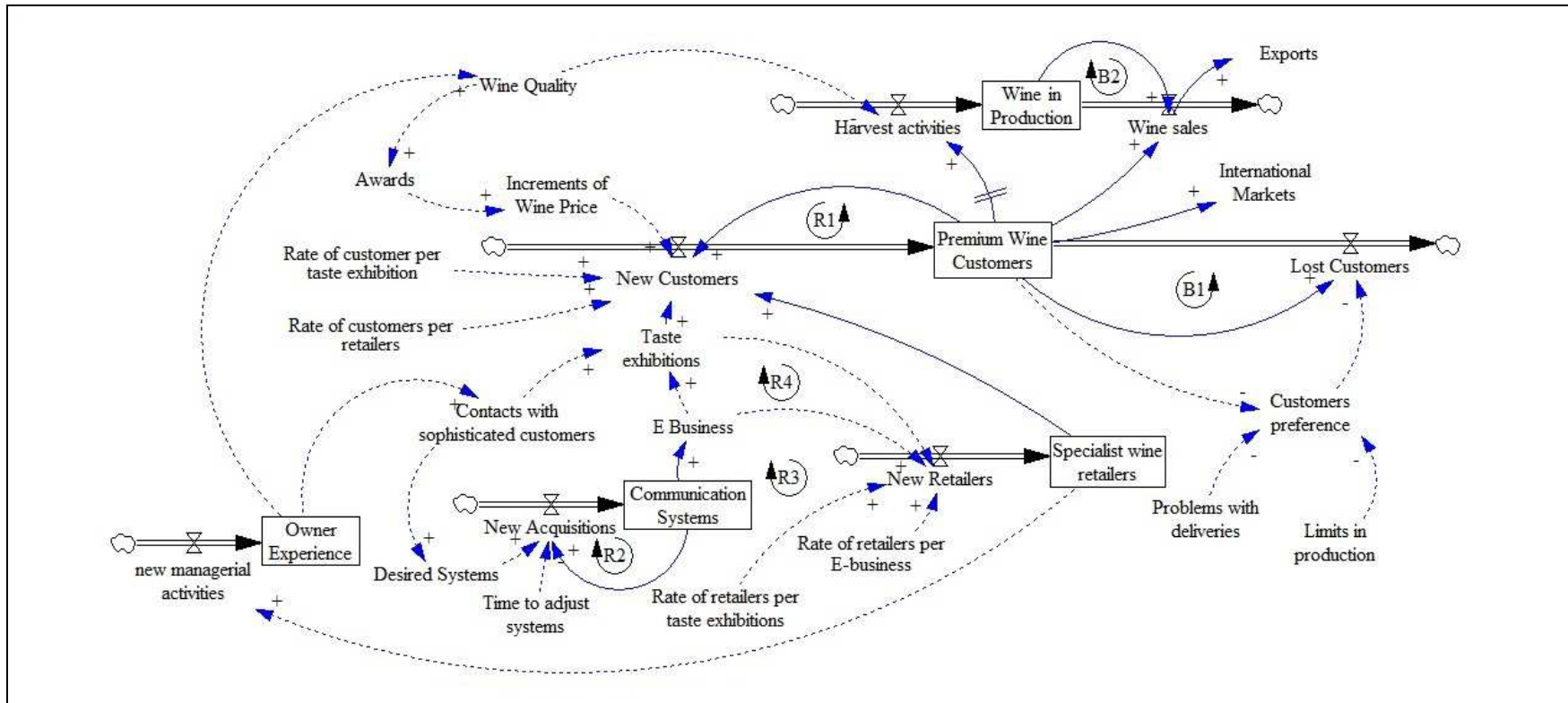


Figure 5.13: The CEO's view of the strategic resource system at IW using a SD model

Where new customers (nc_t) and lost customers (lc_t) have been defined as:

$$nc_t = \alpha_{nc} \cdot C_t + \alpha_{te} \cdot Te_t + \alpha_{wr} \cdot Wr_t \quad (5.10)$$

$$lc_t = (P_c, C_t) \quad (5.11)$$

Equation 5.10 shows that the customer portfolio in year t increases due to the effects of price increments on customers (α_{nc}), as well as the new customers reached at tasting exhibitions ($\alpha_{te} \cdot Te_t$), and through specialist wine retailers ($\alpha_{wr} \cdot Wr_t$). Lost customers' dynamics depends on the relationship between the firm's customer preferences (P_c), and the number of current customers (C_t). I used the look-up function available on VENSIM to model the number of lost customers' dynamic (Equation 5.11). If the firm has customers who demand wines beyond the maximum number of bottles produced by the firm in the last harvest, the firm increases the lost customers. Data used to create the look-up function was obtained from the CEO.

I modelled this nonlinear relationship as a fraction per time period between the disaffiliated customers ($\beta_{lc} \cdot C_t$) and the customer's preference (τ). Specialist wine retailers (Wr_t) have been modelled as follows:

$$Wr_t = Wr_0 + \int_0^t Nr_t dt \quad (5.12)$$

Where, the number of taste exhibitions (Te_t) and e-business activities (Eb_t) increase the number of new specialist wine retailers (Nr_t). β_{Te} and β_{Eb} are the rates of wine retailers reached at tasting exhibitions and through e-business activities respectively.

$$Nr_t = \beta_{Te} \cdot Te_t + \beta_{Eb} \cdot Eb_t \quad (5.13)$$

I measured owner's experience (Oe_t) as the number of experience (negotiations) with specialist retailer developed by Irene (Wr_t) in year t . Irene mentioned that usually there is one negotiation per retailer each year, hence, I assumed this rate for modelling the internationalisation process. Irene also suggested that understanding the wine retailer's preferences is fundamental to make *the wine being perceived as superior*. Even though wine quality depends on several factors, such as weather conditions, irrigation, land, and planting methods, customer's preferences, specially from those who grant wine awards, lead the firm to develop premium wines. Formally, owner's experience has been modelled as:

$$Oe_t = Oe_0 + \int_0^t Wr_t dt \quad (5.14)$$

On the other hand, the wine in production (W_t) for year t is increased if the customer portfolio in the year $t - 1$ increases. The CEO predicts the level of wine in production for next year (Wh_t) by adjusting the number of customers in the last year C_{t-1} to the mean of all historical customers' increments (ΔC_t). Thus, the level of wine in production (W_t) will be decreased if customers (C_t) are higher in year t ⁷.

$$W_t = W_0 + \int_0^t (Wh_{t-1} - Ws_t) dt \quad (5.15)$$

$$Wh_t = (1 + \Delta C_t) \cdot C_{t-1} \quad (5.16)$$

⁷I have simplified the modelling assuming that every customer buys the average amount of wine purchased historically (Δwp).

$$W_{st} = \begin{cases} W_{t-1} & \text{if } (\Delta wp \cdot C_t) - W_t \geq 0 \\ W_{t-1} - (\Delta wp \cdot C_t) & \text{otherwise} \end{cases} \quad (5.17)$$

5.3.4 Rehearsing Strategy in IW

The Base Case Simulation

This base case provided the CEO with a strategic picture of the internationalisation process with a consideration of the dynamics of resources over a set period of time. The IW base case simulation was produced over a period of 5 years starting from 2007. Numerical data were available for the whole period between years 2007—2011. Given that this wine company is relatively new, it is unproductive to extrapolate too far into the future using simulations.

The SD model showed that during 2007 and 2008 (dotted line in Figure 5.14(A)), IW increased the number of its international markets. After two years of a growth plateau (2009—2010), IW incremented its markets. This wine company has only one customer in each market, therefore the dynamic of current customer portfolio had the same behaviour. During the simulation period, exports showed a slight upward trend with some fluctuations in 2010 and 2011 (dotted line in Figure 5.14(B)). The average price for IW's wines experienced a sharp rise after 2009 (dotted line in Figure 5.14(C)). Average price increased mainly as a result of the awards won by IW's wines in 2008, 2009, and 2010. By achieving awards, IW differentiates itself from similar boutique wine companies and reached more customers able to pay higher prices for exclusive wines.

Model Testing Procedures

Confidence in the model was gained by applying a series of recommended and accepted tests for system dynamics models (Morecroft, 2007). I applied two validations: *structure validation* and *behaviour validation*. Table 5.4 shows the statistics for validating the structure of the SD model developed by the CEO of IW.

Table 5.4: Statistics for assessing the SD model's structure validation for IW

<i>Description</i>	<i>Number of factors</i>
Number of variables in the model	30 variables
Number of variables introduced by the CEO	30 variables
Number of non real-world variables	0 variable
Number of variables with problems under extreme conditions	0 variable
Number of links in the model	37 links
Number of links introduced by the CEO	37 links
Number of delays in the model	1 delays
Number of delays introduced by the CEO	1 delays

Structure validation indicates that variables and relationships are consistent with observations about the mental model of people who know the business well. In fact, the match was good because the SD model was developed by the CEO. In summary, all equations are dimensionally correct without the use of non real-world parameters (dimensional consistency), all parameters were suggested by the CEO (parameter verification), and simulations make sense under extreme conditions.

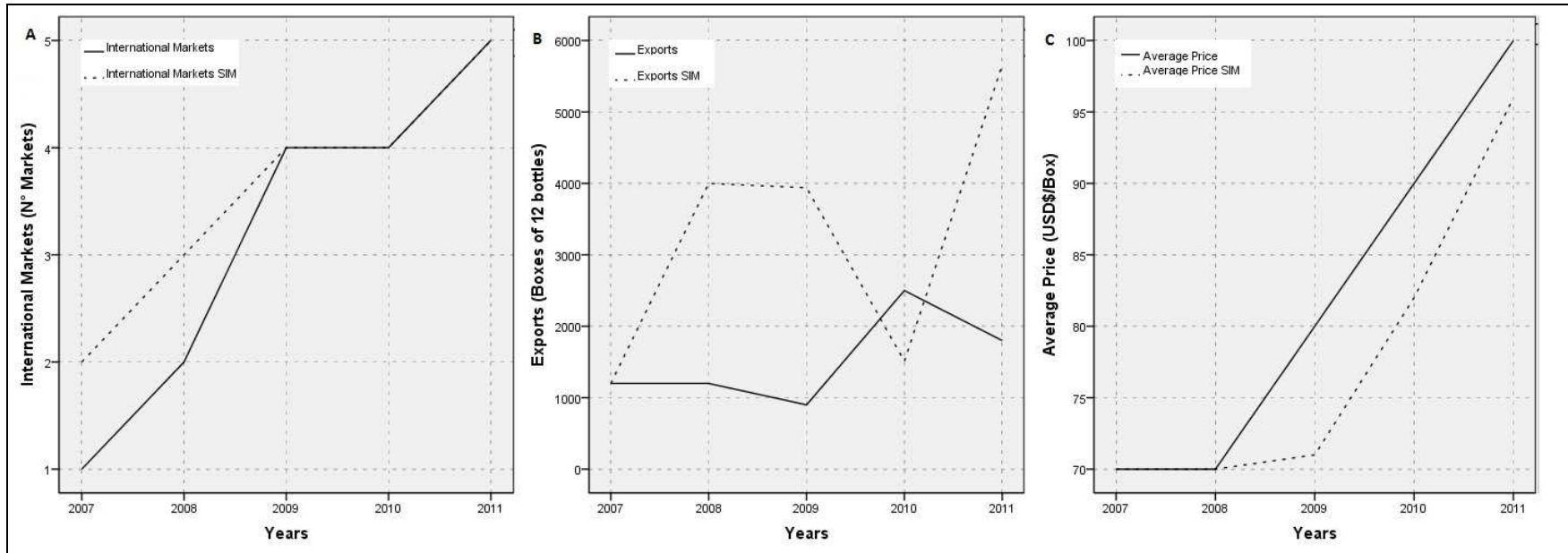


Figure 5.14: Historical fit for the three main variables at IW case.

On the other hand, there was a good quantitative fit in the base case which was consistent with the aim of SD modelling on reproducing the modes of behaviour (Taylor and Dangerfield, 2005). Table 5.5 provides historical statistics for assessing the SD model during 2007—2011.

Table 5.5: Statistics for assessing the SD model fit to data from IW case study

<i>Variable</i>	<i>MAE</i>	<i>MSE</i>	<i>Theil's inequality statistics*</i>			<i>R</i> ²	<i>N</i>
			<i>Bias</i>	<i>Unequal variation</i>	<i>Unequal covariation</i>		
International Markets	0.4	0.4	0.39	0.06	0.55	0.79	5
Exports	2,337	8 · 10 ⁶	0.46	0.30	0.23	0.11	5
Wine Price	4.2	32.2	0.54	0.09	0.37	0.76	5

* The failure to sum to unity is due to rounding errors

Note that the R^2 is low for *exports*, but it is significantly different from zero. Although the simulated and real *exports* have an upward trend, the simulated base case has a high mean absolute error (MAE) equal to 2,337 boxes of wines. The 45 per cent of the mean square error arises from difference of means, reflecting the upward displacement of simulated data points. *International markets* and *wine price* have high R^2 values. Difference of means also explains the displacement of simulated data points in both cases. MAE of *international markets* shows an error of 0.4 markets, that implies a good fit to real data. Also, the average *wine price* has a good fit to real data, because the MAE reaches USD\$4.2 only.

Selecting Strategic Initiatives for Creating Scenarios

Table 5.6 shows the three strategic initiatives suggested by Irene for improving performance. Two initiatives emerged during the sessions of strategy rehearsal (Steps 4), and one initiative emerged from the Step 2 (before the use of SD modelling). Irene is interested in analysing the influences of specialist wine retailers on her exports. Irene could tackle this problem in two ways, either (1) analysing the impact of implementing a strategy focused on increasing the participation in the retailers' customer portfolio or (2) increasing the

number of wine retailers.

Table 5.6: List of strategic initiatives suggested by Irene during the modelling

<i>Strategic Initiatives in IW</i>	<i>#</i>	<i>Step</i>	<i>Description</i>
Register of every bottle	1	2	To include the register of every bottle in the label. For example, Bottle 1 of 1000 bottles, harvest year 2008
Increment activities with current retailers	2	4	To increase participation in the retailers' customer portfolio.
Increase relationships with new retailers	3	4	To increment relationships with new retailers in new markets.

The simulations analysed four scenarios. Scenarios 1 and 2 show the impact of having a low/high participation in the retailers' customer portfolio; Scenarios 3 and 4 show the impact of increasing the number of wine retailers (Figure 5.15). These simulations motivated Irene to talk about the current strategy of internationalisation and its likely outcomes. The dialogue provided opportunities for both assessing strategic ideas and learning from simulated performance.

Scenario 1 assumed a customer/retail rate of 10 per cent. That means Irene would have a low participation in the retailers' customer portfolio. In this scenario, between years 2007 and 2009, both the level of exports and increment of wine prices experienced a jump. From 2010, the dynamics of exports have remained stable with some upward fluctuations, and the increment of wine prices has a slight upward trend. Even though this scenario could be realistic at an early stage of the business cycle, Irene suggested that her prestigious and well-established reputation helped her in reaching more participation of her retailers' customer portfolio. In fact, after the first harvest in 2007, she sold out her production within the first six months that her wine went on sale.

Scenario 2 assumed a customer/retail rate of 90 per cent. That means Irene would have a high participation in the retailers' customer portfolio. This increment in customers leads to increased exports, then between 2009 and 2010 exports reached a plateau that was followed by a decline due to limitations in production capacity. After adjustments to production, the simulation shows a sudden and rapid increase of exports in 2011 followed by an upward trend until 2014. However, the increment of wine prices remains unaffected by this strategy. Even though scenario 2 signals an increment in exports, dealing with few and same retailers limits the firm's chance of getting better prices for its wine. According to Irene, it is crucial to position a wine as cheap or expensive during the initial negotiation with retailers because after that it is very difficult to increment the price to wine retailers.

Scenario 3 assumed a retail/exhibition rate of 10 per cent. That means Irene would get lower increments of new wine retailers through tasting exhibitions. Tasting exhibitions are one of the most popular practices to reach new sophisticated customers and specialist wine retailers. While there are more ways to reach new customers and retailers, Irene identified this practice as central to her business model. Between 2007 and 2011, dynamics of exports are similar to Scenario 2. However, after 2011 the upward trend is slightly lower. On the other hand, dynamics of price increments, followed a trend similar to Scenarios 1 and 2. Nonetheless, in this case the lower increments of new wine retailers affected the levels of price after 2011. The price increments began to rise but with a slight upward trend.

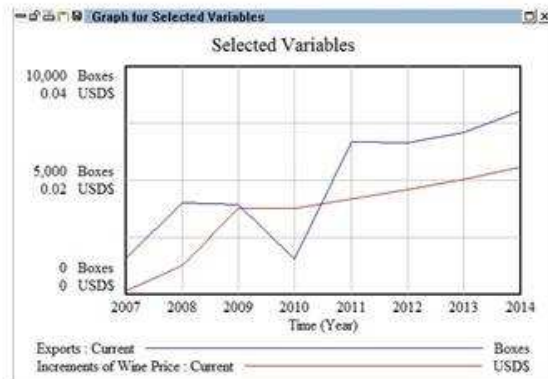
S1 : Rate of customer/retail= 10%



S2 : Rate of customer/retail= 90%



S3 : Rate of retailer/exhibition = 10%



S4 : Rate of retailer/exhibition = 90%



Figure 5.15: Four scenarios showing the impact of specialist wine retailers on IW's exports

Scenario 4 assumed a retail/exhibition rate of 90 per cent. That means Irene would have higher increments of new wine retailers through tasting exhibitions. This scenario shows two potential positive outcomes of the strategy: increments in exports and prices. Considering that one of the challenges of the Chilean wine industry is to have good wines but with lower prices than similar wines from France, this scenario can suggest some new ideas to overcome this paradox. Irene noted that her understanding of retailers' preferences increases her experience. This experience is necessary for developing distinctive and competitive wines. Moreover, the differentiation strategy boots the prices. Even though this scenario shows an upward trend of exports slightly lower than Scenario 2, Irene argued that the essence of boutique wine firms is to achieve the balance between increasing sales and maintaining exclusivity.

5.3.5 Evaluating the SD modelling in IW one year later

One year after the modelling, this wine firm won new awards⁸ and the increment average price of a bottle of wine rocketed by 33 per cent. The CEO suggested that her understanding of the competitive environment and her good-reputation for making wines were factors behind this rapid success of sales. During 2010, IW was within the top ten wines in the two main rankings of Chilean wines (e.g., Guía de vinos de Chile and la CAV). For the harvest 2011, IW had important customers from China, Canada, and Belgium, emergent markets that are able to pay higher prices for premium wines. Figure 5.16 shows the picture of Irene next to the barrels containing the wine that obtained one of the awards during 2010.

This rocketing increase in the prices of wine was suggested if the CEO increased the number of wine retailers through tasting exhibitions (Scenario 4 of the IW case in Chapter 5). During 2010 and 2011, the CEO increased the number of wine retailers in new markets

⁸Information about the awards is available online: <http://www.iwines.cl>.



Figure 5.16: Barrels which obtained one of the awards in 2010

and as a consequence this company could increment both the price and the number of exports. This finding suggests that the CEO developed the resources following the learning she gained from the scenarios. Although both LR and IW obtained better business results, the development of resources were completely different in each company. This result highlights the role of CEO's mental models for reaching superior firm performance.

5.4 Supporting the Internationalisation of CT

In this company, Felipe started his new venture only one year before our first round of meetings. He was interested in participating in this project because he wanted to receive some feedback on his current internationalisation process. Felipe was the youngest and least experienced CEO of the five participants, he had no prior experience in international-

isation before starting up CT. I supported Felipe in some strategic decisions related to the evaluation of increasing the payment risk from customers on the firm's performance. In the section below, the individual case study report of CT is presented. This report shows the four steps of modelling in this fruit company: (1) Conceptualisation, (2) Definition of Resource System, (3) Resource Development, and (4) Rehearsing Strategy.

5.4.1 Conceptualisation Process at CT

I started the meeting by asking Felipe how his company has developed the internationalisation process. This general question allows me to grasp the CEO's degree of understanding about the process. The conceptualisation step took up around 30 minutes of the first meeting. In response to my first question, the CEO commented:

Quotation N 1

'the origin of exports was circumstantial, I have a farm with plum trees [...] one year ago, an Argentinean broker was interested in buying my plums [...] However, they were interested in several tons of dried plums, hence I initialised the line of CT as an export company, I collected dried plums from other agriculturists ... (and then) I exported the dried plums'.

CT's internationalisation process is based on making deals with international fruit retailers in Argentina and Brazil (Quotation 1). Once CT has an deal, the CEO negotiates with small agriculturists in Chile to buy their plums at a determinate price. CT, then collects the fruit from these small agriculturists and export these plums together with plums from its own farm. Figure 5.17 shows Felipe's dried plums.



Figure 5.17: CT's dried plums

Quotation N 2

'I realised that nobody (other agriculturists) in my town (Chimbarongo) were working simultaneously as agriculturist and exporter, hence I identified an opportunity to collect the plums from them and sell the plums directly to international brokers in Argentina and Brazil [...] In the first export, the operation of delivery the fruit to Argentina left me limited returns'.

Currently, Felipe has not explored alternative internationalisation strategies, such as joint venture, alliances, or foreign direct investments (Quotation 2). In fact, he does not have any kind of marketing activities and only uses his networking to make deals abroad. During the last year, Felipe successfully exported 750 tons of dried plums to Argentina and Brazil. He emphasised that his prior experience in advising fruit companies on harvest

activities encouraged their internationalisation.

Quotation N 3

‘My internationalisation has been motivated by my experience in the internal market (Chilean fruit market), my networking with international brokers, and my knowledge of doing business with small fruit retailers’.

Felipe has 10 years of experience working in the fruit industry (Quotation 3). However, he had neither prior international experience nor formal training in international business. This lack of know-how affected his initial negotiations. In fact, when I asked him about his strategies for contacting his international customers, he said:

Quotation N 4

‘One of my best friends advised me to contact an Argentinean broker who was interested in dried plum [...] The first time, two agents from this Argentinean company visited my farm and I showed them my fruit as well as other farms with plums’.

In the case of Felipe’s first negotiation, he faced a different way of bargaining that almost did fail his first export (Quotation 4). However, his learning orientation allowed him to learn about such cultural issues quickly (e.g timing in negotiation and bargaining styles) in order to agree a deal in the short term.

5.4.2 Boundaries of the Resource System in CT

I asked Felipe to map the internationalisation process by drawing it on a chart. While Felipe was drawing the picture, I simultaneously explored the possible strategic resources

perceived by him during the conceptualisation step.

Figure 5.18 shows Felipe's scheme of his internationalisation. He collects dried plums from other agriculturists, then he contracts a cargo agency. Part of these plums are left in San Rafael (Argentina), and the rest of plums are sent to Santa Catarina, a state in southern Brazil (Quotation 5 explains the CT's export process).

Quotation N 5

'The internationalisation process was initially complex for me. Each truck has 25,000 kg of loading capacity. Hence, I had to negotiate with several small agriculturists to use the full capacity. Simultaneously, I had to negotiate with the Argentinean broker for the final price of the plums [...] Once I have a price and the final quantities of plums, I had to contact a customs broker in Chile to supervise the export process'.

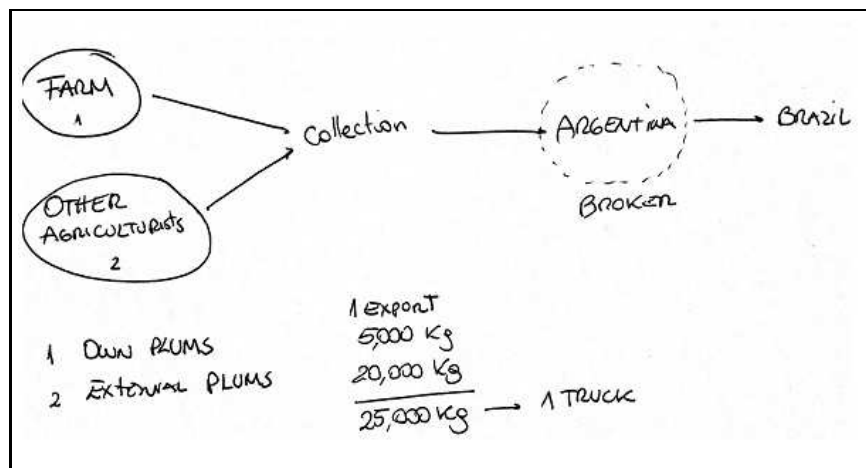


Figure 5.18: CEO's diagram of CT's internationalisation

Although the sketched process looks simple, Felipe perceives his firm's internationalisation as a complex process. He suggested that to deal with new cultural issues (e.g., bargaining forms and tactics, negotiation timing, and international supply chain process) is a difficult task because when you face an international negotiation for first time, you do

not know how your customer might be react to your offer or how your product will arrive at its destination.

5.4.3 Resource Development in CT

Considering the following comments from Felipe, I illustrate the process of how the CEO identified potential strategic resources and their causal relationships. Here, resources are shown in **bold** and their effects on the development of the other resources in *italics*.

Quotation N 6

‘**My production** depends on *my harvest activities and fruit collection from external agriculturists* [...] I have to fill each truck with 25,000 kg of fruit [...] In the first export, I produced 5,000 kg and the remaining 20,000 kg was collected from external **agriculturists**’.

Production and external agriculturists were identified as strategic resources because both are the drivers of exports (Quotation 6). In the first export, the CEO only had 5,000 kg and the rest was collected externally. This first event determined his business model.

Quotation N 7

‘I have a limited **production** [...] Although land productivity can be increased, I expect to grow through collecting fruit from external **agriculturists** [...] By increasing the number of **agriculturists** you are able to *export a bigger amount of fruits*, however more **agriculturists** also increment the complexity of the whole negotiation prior shipment [...] in most of the cases, *you have to pay the agriculturists in advance part of the price before sending* the fruit to the international **brokers**’.

The CEO indicates that in most of the cases he has to pay the agriculturists an amount of money for their plums before they are exported (Quotation 7). This factor limits the CT’s capacity to increase the number of external agriculturists.

Quotation N 8

‘After you have done business with certain **brokers**, *they connect you with other **brokers** who operate in other regions or countries* [...] new potential buyers (**brokers**) *increase the payment risk* [...] *The payment risk is highly sensible* because the financial resources I invest for exporting each time, are over the 70 per cent of my annual budget’.

While Quotation 8 shows that current broker can help CT reach potential brokers, nonetheless, Felipe perceives that having new brokers increases the payment risk. Although there are several contractual terms that establish penalties in such cases, in the fruit industry the probability of receiving delayed payments is high. Figure 5.19 shows the CEO’s preliminary causal map drawn in session in which the CEO identified three relevant resources: *international brokers*, *plum in production*, and *external agriculturists*. During the next meeting this model was slightly refined, however the central characteristics remained stable as shown in Figure 5.20.

Figure 5.20 shows the final SD model developed using the VENSIM software. Here, the dynamics of *plum in production*(Pp_t) have been modelled as follows:

$$Pp_t = Pp_0 + \int_0^t (pc_t - ps_t)dt \quad (5.18)$$

The plum collection (pc_t) and plum sale (ps_t) have been defined as:

$$pc_t = \alpha_{land} \cdot H_{land} \cdot \triangle_{prod} \quad (5.19)$$

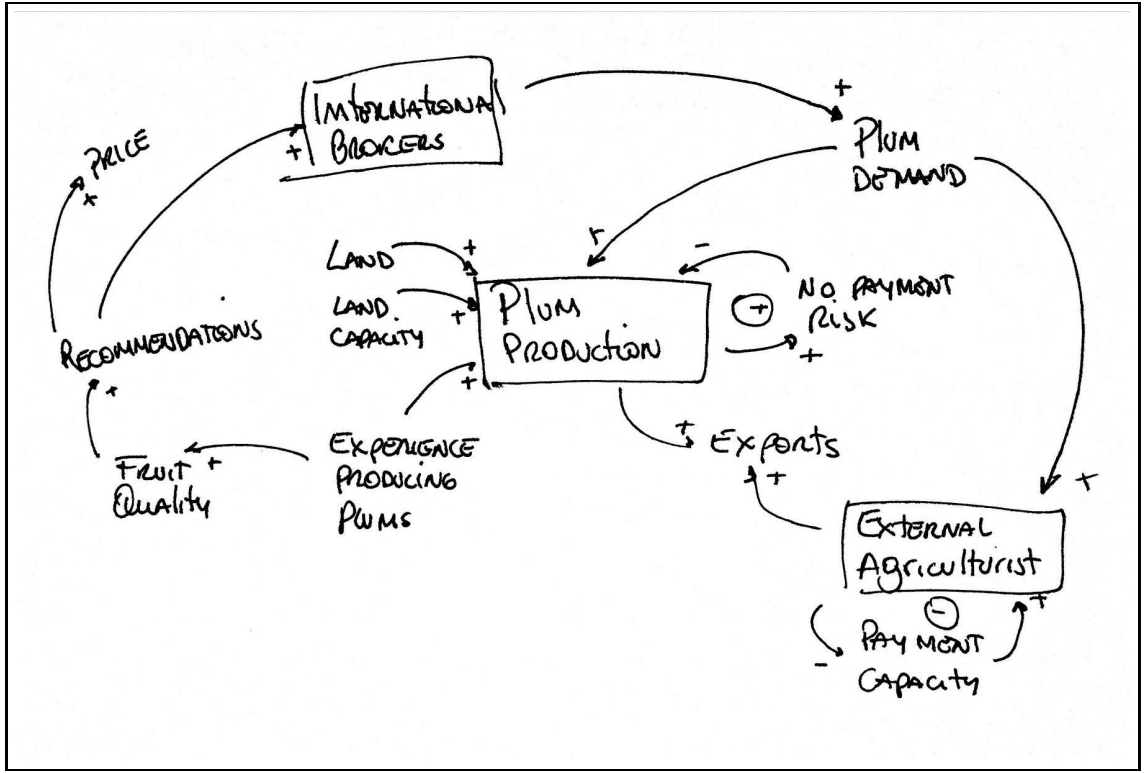


Figure 5.19: The CEO's preliminary causal map drawn in session

$$p_{st} = \begin{cases} Pp_t & \text{if } Dp_t - Pp_t \geq 0 \\ Pp_t - Dp_t & \text{otherwise} \end{cases} \quad (5.20)$$

In Equation 5.19, H_{land} is the number of hectares of plums; α_{land} is the number of plums tha can be produced per hectare; and Δ_{prod} is the increment of land productivity based on Felipe's experience as an agriculturist. In Equation 5.20, I assumed that the plum sale in t depends directly on the quality of plums demanded by brokers in t (Dp_t). Since Felipe collects dried plums from external agriculturists in order to satisfy demand, the number of *external agriculturists* (Ea_t) is defined by:

$$Ea_t = Ea_0 + \int_0^t (na_t - la_t) dt \quad (5.21)$$

The new agriculturists (na_t) and the lost agriculturists (la_t) have been defined as:

$$na_t = \frac{Dp_t - Pp_t}{\alpha_{ea}} \quad (5.22)$$

$$la_t = f(C_{ma}, Ea_t, Dp_t) \quad (5.23)$$

Equation 5.22 shows that the number of external agriculturists in year t increases due to the effects of brokers' demand increments (Dp_t). Hence, new external agriculturists (na_t) was modelled as the difference between the brokers' demand (Dp_t) and the firm's production (Pp_t) in year t , divided by the mean of the individual production capacity of external agriculturists (α_{ea}). Lost agriculturists' dynamics depends on the relationship between the firm's capacity to manage agreements (C_{ma}), and the number of external agriculturists (Ea_t). I used the look-up function available on VENSIM to model this nonlinear first-order negative feedback relationship (Equation 5.23). If the firm has brokers whose demand for plums (Dp_t) is beyond the maximum quantity of plums available to be collected with the current financial resources, the firm increases the lost agriculturists. I suggested that CT has a hypothetical maximum budget for managing the relationships with every agriculturist because the CEO indicates that in most of the cases he has to pay the agriculturists an amount of money for the plums before they are exported. Data used to create the look-up function was obtained from the CEO.

The number of brokers (B_t) is modelled as,

$$B_t = B_0 + \int_0^t (nb_t - lb_t)dt \quad (5.24)$$

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The number of new international brokers (nb_t) and lost international brokers (lb_t) have been defined as:

$$nb_t = R_t \cdot \beta_{rec} + B_t \cdot \beta_{neg} \quad (5.25)$$

$$lb_t = B_t \cdot \pi_{pr} \quad (5.26)$$

Equation 5.25 shows that Felipe gains new brokers through the recommendations of international brokers (R_t). Felipe remarks that once he has successfully negotiated with a broker and established a closer relationship the broker is likely to connect him with other brokers who operate in other regions or countries. I defined (β_{neg}) as the rate of new brokers contacted from current brokers' recommendations, and (β_{rec}) as the rate of new brokers contacted from Felipe's networks. Felipe emphasised during the meeting that his major fear is the payment risk. He defined payment risk as the risk of receiving the payment six months after the agreed date.

5.4.4 Rehearsing Strategy in CT

The Base Case Simulation

This base case provided the CEO with a strategic picture of the internationalisation process with a consideration of the dynamics of resources over a set period of time. The CT base case simulation was produced over a period of 2 years starting from 2008. Numerical data were only available for the period between 2008 and 2009. I extrapolated over 5 years by assuming that CT will not increment the size of its land until 2014.

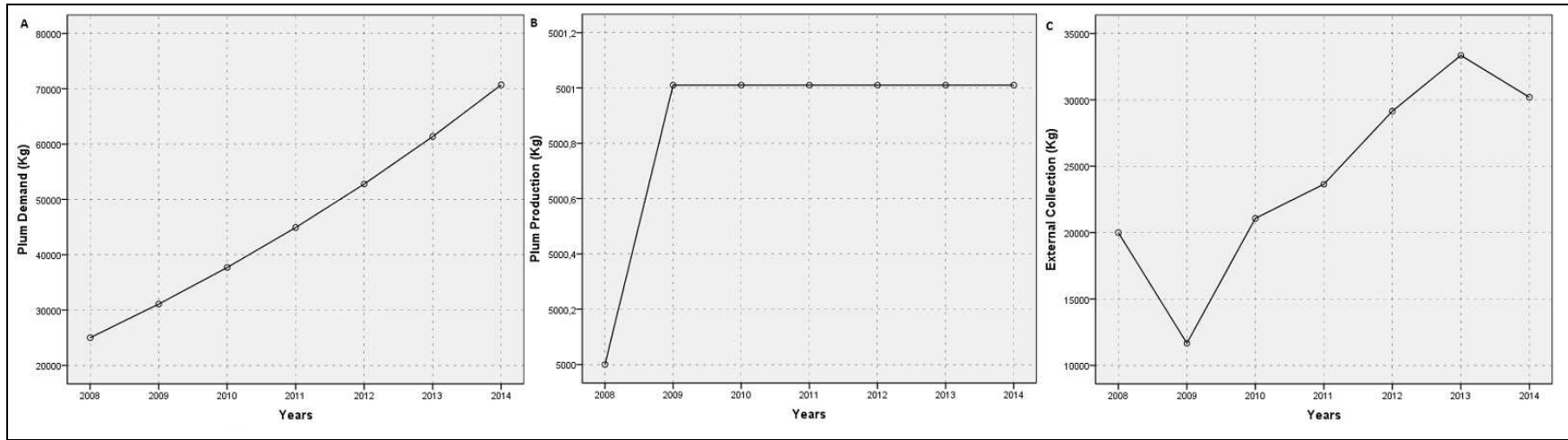


Figure 5.21: Historical fit for the three main variables at CT case.

The model developed by the CEO showed a steady growth of fruit demand during 2008—2014 (Figure 5.21(A)). This demand is based on the assumption of an increment in the number of brokers in the short term (6 years). The production of plums rose gently between 2008 and 2009 due to increments in land productivity. After 2009 however, the production remained static until the end of simulations (Figure 5.21(B)). This constant production pushed CT to increment the collection from external agriculturists in order to satisfy brokers' demand (Figure 5.21(C)). Collection dynamics had a growth phase between 2009 and 2013. However, after 2013 a stagnation phase started during which growth ceased as a result of consolidation.

Model Testing Procedures

Confidence in the model was gained by applying a series of recommended and accepted tests for system dynamics models (Morecroft, 2007). I applied two validations: *structure validation* and *behaviour validation*. Table 5.7 shows the statistics for validating the structure of the SD model developed by the CEO of CT.

Table 5.7: Statistics for assessing the SD model's structure validation for CT

<i>Description</i>	<i>Number of factors</i>
Number of variables in the model	23 variables
Number of variables introduced by the CEO	23 variables
Number of non real-world variables	0 variable
Number of variables with problems under extreme conditions	0 variable
Number of links in the model	29 links
Number of links introduced by the CEO	29 links
Number of delays in the model	0 delays
Number of delays introduced by the CEO	0 delays

Structure validation shows that variables and relationships are consistent with observations on the mental model of people who know the business well. In fact, the match was good because the SD model was developed by the CEO. In summary, all equations are dimensionally correct without the use of non real-world parameters (dimensional con-

sistency). All parameters were suggested by the Felipe (parameter verification), and the simulations make sense under extreme conditions. Since, CT only had data from two years (2008–2009), it was not possible to assess how the SD model was reproducing the modes of behaviour (Taylor and Dangerfield, 2005). However, the base scenario was constructed using hypothetical data based upon information provided by Felipe.

Selecting Strategic Initiatives for Creating Scenarios

Table 5.8 shows the two strategic initiatives suggested by Felipe for improving performance. Both initiatives emerged during the formal sessions of the SD modelling (Steps 3 and 4). Felipe was interested in analysing the impact of payment risk on his exports. During the meeting, Felipe suggested that the payment risk is the most relevant variable when an entrepreneur starts up a new international venture. Even though there are mechanisms to reduce this risk in practice. It is very difficult to eliminate payment delays.

Table 5.8: List of strategic initiatives suggested by Felipe during the modelling

<i>Strategic Initiatives in CT</i>	<i>#</i>	<i>Step</i>	<i>Description</i>
Increase fruit collection	1	3	Increase the percentage of fruit collected from external agriculturists.
Increase domestic sales	2	4	Increase domestic sales as a consequence of international payment risk.

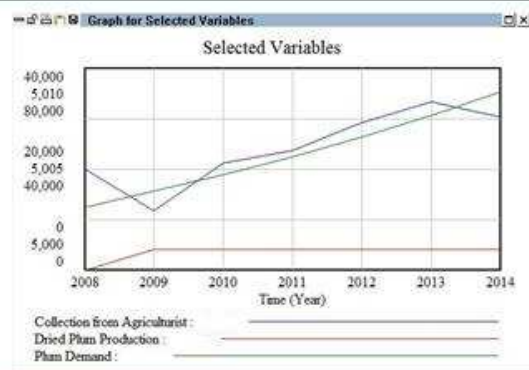
The simulations presented Felipe with four scenarios depending on different payment risk levels (Figure 5.22). These simulations motivated Felipe to discuss the firm’s current strategy of internationalisation and its likely outcomes. The dialogue provided opportunities for both assessing strategic ideas and learning from simulated performance.

Scenario 1 assumed a payment risk of 1 per cent in the entire simulation. In this case, the simulation shows an upward trend of demand that leads to an increased collection of plums from external agriculturists. However, after 2013 the collection of plums entered a stagnation phase as a result of the limited financial resources available for further expansion of the number of external agriculturists. As Felipe did not have any plan to expand the land in the next 10 years, his only increment of land productivity in 2009 was related to the methods and technology used to plant, irrigate, and harvest the plums.

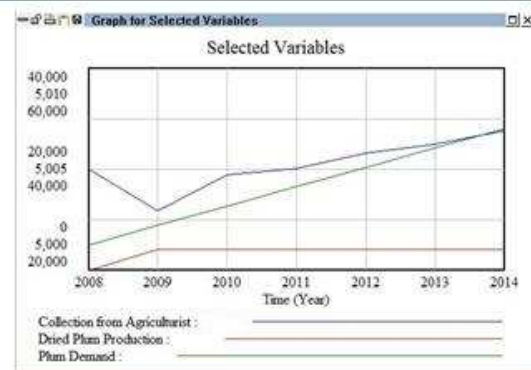
Scenario 2 assumed a payment risk of 10 per cent in the simulation. This scenario shows a similar upward trend of demand seen in scenario 1. However, the levels of increments in demand are lower. Even though this result suggests that Felipe should collect plums from external agriculturist during the whole analysed period (2008—2014), the stagnation phase of collecting external plums would start in 2011. Dynamics of the plum in production had the same variations from scenario 1.

Scenario 3 assumed a payment risk of 25 per cent in the simulation. This case shows a slight upward trend of demand that caused a fall in collecting of external fruit in 2009. After a slow increment in 2010, however the collection of plums from external agriculturists enjoyed a period of stability. Felipe suggested that this scenario captured certain ideas about the future of his company. He argued that the stability in demand could be caused by his shortcoming in finding more international brokers rather than the payment risk. But he agreed that the payment risk was a sensitive variable in shaping the future of his organisation.

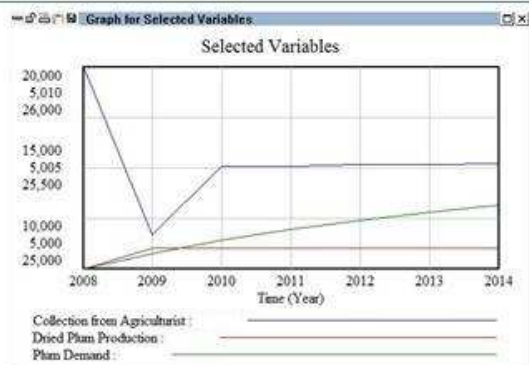
S1 : Payment risk = 1%



S2 : Payment risk = 10%



S3 : Payment risk = 25%



S4 : Payment risk = 50%

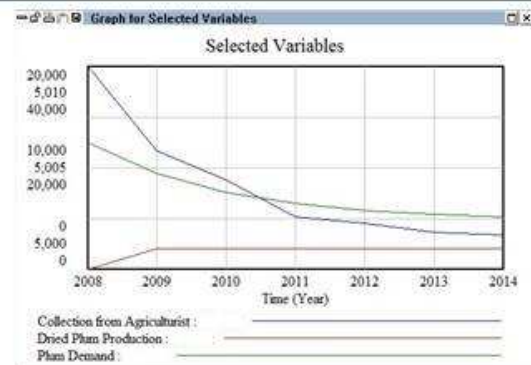


Figure 5.22: Four scenarios depending on different payment risk levels

Scenario 4 assumed a payment risk of 50 per cent in the simulation. Felipe classified this case as the worst case scenario. Having a payment risk of 50 per cent means that CT will lose at least 50 per cent of its brokers. Simulations show that at this level of payment risk, the downward trend of demand pushes the firm to decrease the level of collection from agriculturists. From 2011, the demand began to stabilise and eventually reached an equilibrium phase after 2013. This scenario also shows that the risk of reducing agriculturists can be an opportunity for rival firms to collect and export the plums to other international markets.

5.4.5 Evaluating the SD modelling in CT one year later

This fruit company reduced the collection of plums because one of the international brokers did not pay on time, and therefore, several agriculturists did not allow CT to collect fruit in the following year (2011). In fact, CT lost the harvest season in 2011 and could only collect the fruit from the external agriculturists. This situation was predicted in the Scenario 4 of the CT case (Chapter 5). Even though the CEO classified this case as the worst case scenario, he did not do anything to decrease the no-payment risk. This finding suggests that the CEO did not learn from the scenarios (or at least did not take it into account), and therefore, he could not anticipate the future. However, Felipe argued that his lack of experience in developing international business was the main reason for this failure. Felipe was the least experienced CEO of the five case studies with only one year's experience in developing an international business). This lack of experience limited the CEO's ability to reflect on the scenarios. It also meant he was unable to trigger solutions when critical problems emerged. Although the main purpose of supporting the internationalisation of CT was not achieved because the CEO did not follow the suggestions provided, the strategic modelling of the different scenarios showed that system dynamics

is a useful tool in analysing the outcomes of strategy.

5.5 Supporting the Internationalisation of AF

In this company, I supported the CEO's process of building the SD model. Initially, he was interested in improving his internationalisation strategy by understanding how to export apples to India. Two initiatives were supported: the evaluation of increasing the attendance to marketing events (e.g., fair trade, and round tables), and the analysis of increasing customer service capacity. However, two months after the modelling experience, he resigned from the family business and opened a new fruit export company. This report shows the four steps of modelling in this fruit company: (1) Resource Conceptualisation, (2) Definition of Resource System, (3) Resource Development, and (4) Rehearsing Strategy.

5.5.1 Conceptualisation Process at AF

To start the meeting I asked Ismael to describe how his company has developed its internationalisation process. This general question allows me to assess alternative ways for discovering Ismael's degree of understanding about the process. I will only show some main extracts of Ismael's conceptualisation for exemplifying this process. This step took around 40 minutes of the first meeting. Responding to my first question, the CEO commented:

Quotation N 1

'Firstly, I'm going to explain that some of our products are target at the local market, such as wine grapes and citrus fruits, but the rest of the fruit varieties: apples, apricots, oranges, plums, pears and table grapes are export products [...] AF had a sequential internationalisation process. First, we export small amounts of fruit in order to understand the global supply chain process, then we slowly increase the export intensity with those customers who are closer geographically, and finally we expand the exports to more distant places'.

Quotation 1 shows that AF follows a sequential internationalisation process. According to Ismael, AF had a sequential internationalisation process similar to the Uppsala Model: firstly, export small amounts of fruit in order to understand the global supply chain process, then slowly increase the export intensity with those customers who are closer geographically, and finally expand exports to more distant places. Today, this company exports apples, apricots, oranges, plums, pears, and table grapes. Only wine grapes and citrus fruits are reserved for the local market.

Currently, *AF* exports to various international markets, such as United Kingdom, United States of America, France, South Korea, Russia, Spain, Netherlands, and Italy. Its internationalisation strategy is based on capturing potential customers through trade fairs and different databases. Most of these customers are fruit brokers (distributors) located in foreign countries. Nonetheless, AF has not explored other alternative strategies, such as joint venture, alliances or foreign direct investments (Andersson, 2004).

Figure 5.23 shows AF's statistics for the number of markets, exports, and average prices between 2000 and 2010. Graph 1 (from left to right) shows a rapid growth of markets in the last 5 years. Exports experienced a growth phase between 2000 and 2008. After 2008, a stagnation phase started during which growth ceased as the result of consolidation. In year 2010, the abrupt fall was a consequence of the Chilean earthquake in February of 2010. Average prices of AF's fruit show an upward trend. While AF has incremented quality standards and productivity in the last few years, the rise of prices is explained by an increased international demand for fruit.

Quotation N 2

‘We are centralising our activities where our fruit are produced [...] one of the factors that determines the quality is location. Moreover, we have limited financial resources, so we prefer to sell directly to international brokers rather than to set up our activities abroad’.

Since Ismael perceives location as one of the factors affecting the quality of his fruits, he tries to centralise all activities within the production plants to reduce cost. Even though Ismael opened an office in Santiago, when AF started to orientate to international markets it was no longer necessary to have a commercial office in the Capital because international customers want to see the fruit and the process of collection to make sure quality and standards are met (Quotation 2). Figure 5.24 shows AF’s production plants.

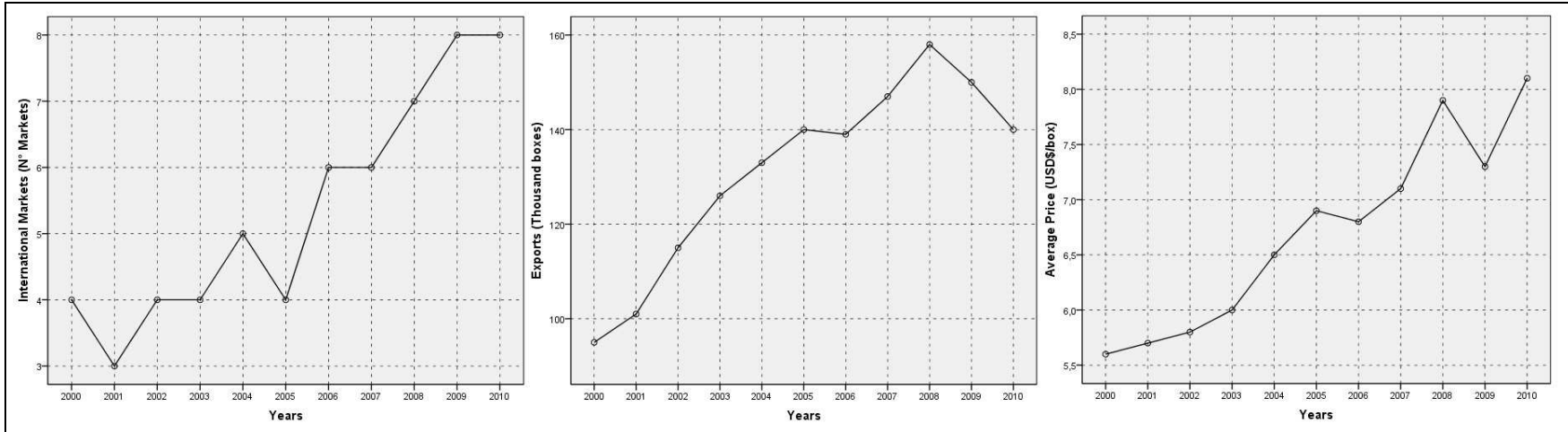


Figure 5.23: The AF's statistics



Figure 5.24: Packaging fruits for export

Quotation N 3

‘Nowadays with communication technologies, it is not necessary to have several commercial offices, [...] international brokers buy the fruit that has a good quality and is well processed’.

Ismael suggests that exporting via an agent or distributor is one of the most common internationalisation strategies of SMEs (Quotation 3) – this strategy allows low depth of involvement in foreign markets and requires little time to implement (Grant, 2008).

5.5.2 Boundaries of the Resource System in AF

I asked Ismael to map the firm’s internationalisation process by drawing it on a chart. While Ismael was drawing, I simultaneously investigated the possible strategic resources

perceived by him during the conceptualisation step.

Figure 5.25 shows Ismael's scheme of internationalisation. AF's internationalisation begins with harvesting the fruits. The firm then transfers the collected fruits to its production plant. Here they have cooler storages to pack the fruit in pallets and develop all sanitary controls before exporting the fruits.

Quotation N 4

'Firstly we harvest the fruits according to the season. This process is monitored by me, our agronomist engineer and an external advisor called Syngenta [...] The harvest process depends on how we have prepared the land, specially how we fertilised, irrigated, and supplied pesticides to the trees.[...] Once we know what and how many fruits our customers want, we pack according to the international food standards that every country requires [...] this process is controlled by the SAG (Government Agency of Agriculture)[...] Finally we export to our customers'.

Quotation 4 shows the description of the harvest process (superior side of Figure 5.25) developed by Ismael. Then in the inferior side of Figure 5.25, he verbally highlighted the importance of communication and confidence of customers (Quotation 5).

Quotation N 5

'In this business everything is about trust and commitment, because when you send fruits, it can be affected by external conditions, such as higher temperature in aircraft's storage, delays, and so on, that affect the fruit's quality and finally the price. If you don't have a good relationship with your customers, they can charge penalties under these circumstances even though we have a deal using FOB (Valparaiso) prices^a [...] A good communication with your customers is the base of exporting fresh fruit'.

^aFree On Board (FOB)(shipping point) price refers to a price which includes goods plus the services of loading those goods onto a named location.

5.5.3 Resource Development in AF

Considering the following quotations of Ismael, I illustrate the process of how the CEO identified potential strategic resources and their causal relationships. Here resources are shown in **bold**, and their effects on the development of the other resources in *italics*.

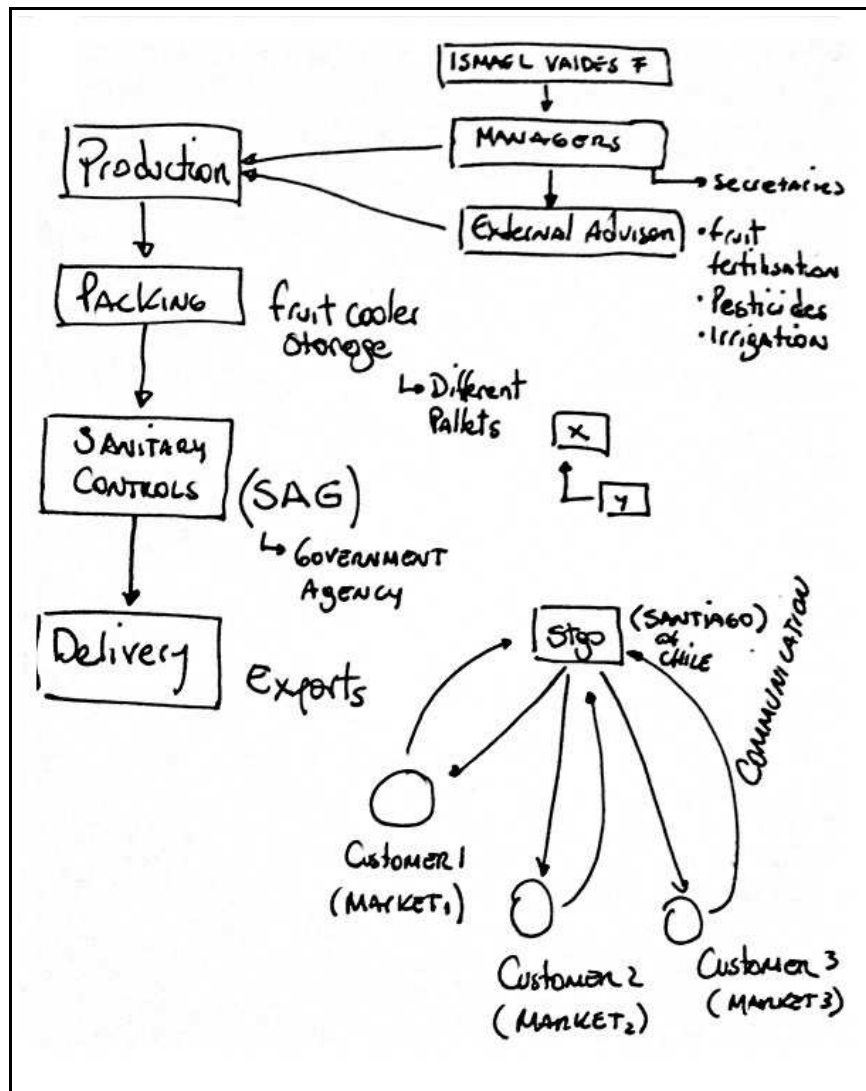


Figure 5.25: CEO's diagram of AF's internationalisation

Quotation N 6

'Understanding the needs of our **customers** is fundamental to developing a long term relationship [...] This depends on **my experience** and my father's advice [...] my father was one of the first Chilean entrepreneurs who exports fruit regularly as part of the business (international orientation) [...] **The experience** in doing business abroad and visualising opportunities (opportunity orientation) in foreign markets is fundamental to our current success [...] Another factor is the quality of our fruit [...] (that depends on) investment in new store technology and the services provided by external advisors'.

Ismael suggests that the development of customer portfolio, international orientation, opportunity orientation, and investment in technology make up the core of his business

(Quotation 6). He also recognises experience as a strategic resource within this industry. Experience is rare and difficult to imitate because it is transferred from father to son as part of a family tradition of fruit exporters.

Quotation N 7

*'Attending trade fairs and roundtables is a mechanism to increase your **networking** [...] **customer's** recommendations are a source to reach and select new customers, for example, I focus on selecting new customers who have been recommended by current customers, otherwise, I only export them small fruit quantities until I make sure that these customers pay regularly [...] *payment problems are always a threat for small and medium-sized exporters* [...] to be honest, the **experience** is the *driver of selecting* the **customers** correctly, I call this concept 'olfato en los negocios' (a knack for business).'*

Networking was identified by Ismael as another strategic resource (Quotation 7). Since Ismael negotiates with potential customers at roundtables and trade fairs, having a strong network allows him to establish himself as a good reliable exporter, as well as stay in touch with people interested in AF's products.

Figure 5.26 shows the CEO's preliminary causal map drawn in session in which the CEO identified four relevant resources: *Fruit in production*, *CEO experience*, *Networking*, and *Fruit customers*. During the next meeting, this model was slightly refined, however, the central characteristics remained stable as shown in Figure 5.27. Figure 5.27 shows the final SD model developed using the VENSIM software.

Ismael suggested that fruit in production(F_t) for year t is increased if the company makes improvements in the quality of fruits, recommendations from customers (networking), international certifications, product customization in packaging, and CEO's characteristics related to international orientation, opportunity orientation, and e-business skills (α_t). He plans the fruit in production for next year (Fh_t) by adjusting the number of customers

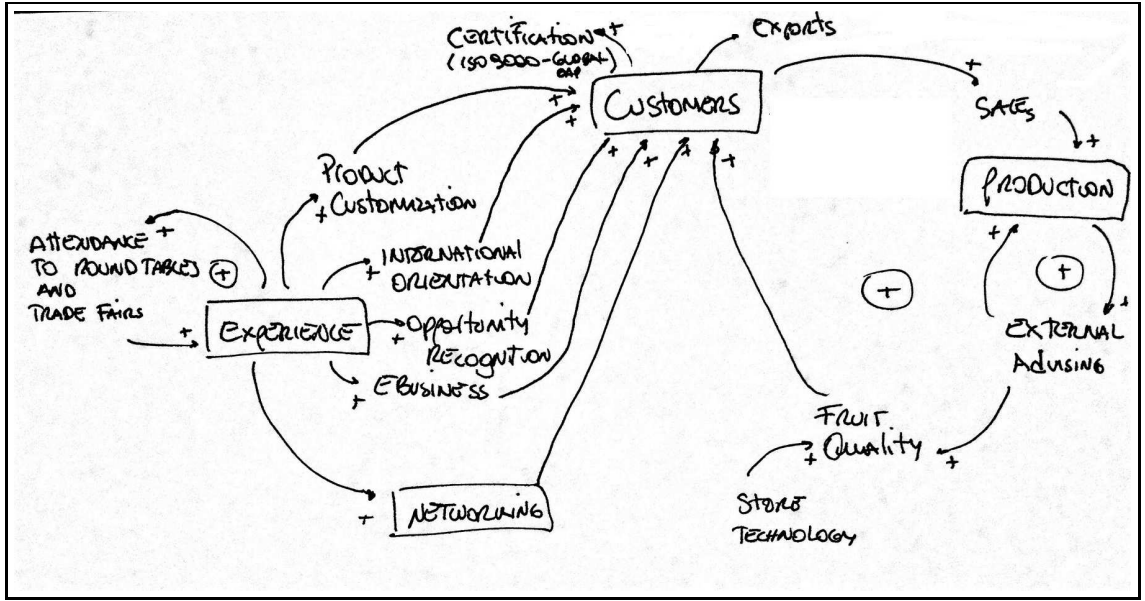


Figure 5.26: The CEO's preliminary causal map drawn in session

in the last year C_{t-1} to the mean of all historical customers' increments (ΔC_t). However, the number of customers (C_t) decreases if the company increases the number of unfulfilled deals concerning quality, time, and initial conditions of exports (Ua_t) in year t ⁹.

$$F_t = F_0 + \int_0^t (Fp_t - Fs_t)dt \quad (5.27)$$

$$Fh_t = (1 + \Delta C_t) \cdot C_{t-1} \quad (5.28)$$

$$Fs_t = \Delta fp \cdot C_t \quad (5.29)$$

⁹I have simplified the modelling assuming that every customer buys the average of fruit purchased historically (Δfp).

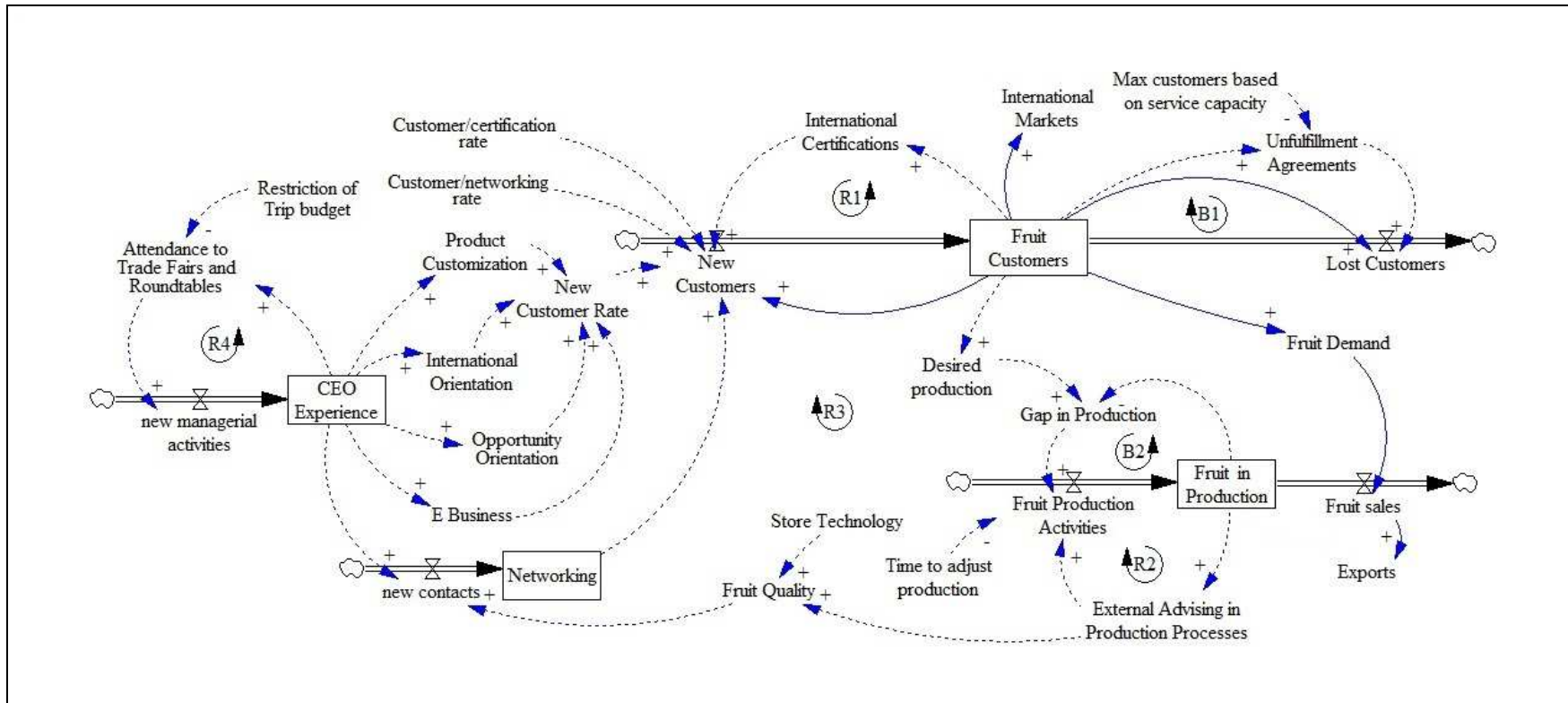


Figure 5.27: The CEO's view of the strategic resource system at AF using a SD model

Formally, the dynamics of Customer Portfolio (C_t) have been modelled as follows:

$$C_t = C_0 + \int_0^t (nc_t - lc_t) dt \quad (5.30)$$

New customers (nc_t) and lost customers (lc_t) have been defined as:

$$nc_t = \alpha_t \cdot C_t \quad (5.31)$$

$$lc_t = Ua_t \cdot C_t \quad (5.32)$$

Lost customers' dynamics have been modelled as a nonlinear first-order negative feedback system (Equation 5.32), where the unfulfilled deals (Ua_t) are caused by exceeding the maximum capacity to manage customers (τ). I used the look-up function available on VENSIM to model the unfulfilled-deal variable¹⁰ (Equation 5.33).

$$Ua_t = f(\tau, C_t) \quad (5.33)$$

Ismael suggested that CEO experience (E_t) for year t is increased if the CEO increases the number of negotiations with customers. At AF, Ismael negotiates with customers in roundtables and trade fairs. Therefore,

$$E_t = E_0 + \int_0^t \gamma_t dt \quad (5.34)$$

The number of events that allows the CEO to negotiate with customers (γ_t) for year t is affected by the number of prior negotiations with customers (E_t) and the average of

¹⁰Considering that Ismael suggested that AF has a limited capacity to negotiate with multiple customers at the same time, I have simplified this nonlinear relationship assuming a theoretical nonlinear relationship between unfulfilled agreements and the number of current customers. Beyond the maximum capacity, the company increases the number of unfulfilled deals.

unitary cost of attendance (ϕ_A). Ismael also suggested that the number of attendance at such events (γ_t) is limited by his annual travel budget (δ_{bud}).

$$\gamma_t = \frac{E_t \cdot \phi_A}{\delta_{bud}} \quad (5.35)$$

Networking (Nw_t) is defined as the rate of people contacted during each negotiation (η_{Nw}) who connect AF with new customers, multiplied by the number of CEO experiences negotiating with customers (E_t).

$$Nw_t = Nw_0 + \int_0^t \eta_{Nw} \cdot E_t dt \quad (5.36)$$

Finally, exports (X_t) were modelled as the ratio of exports (γ_i) multiplied by the number of sales (S_t).

$$X_t = (\gamma_i \cdot S_t) \quad (5.37)$$

5.5.4 Rehearsing Strategy in AF

The Base Case Simulation

The base case provided the CEO with a strategic picture of the internationalisation process with a consideration of the dynamics of resources over a set period of time. The AF base case simulation was produced over a period of 11 years starting from 2000. Numerical data were available for the whole period between years 2000—2010.

Simulation of this base case showed that AF increased the number of international markets steadily during the period of 2000—2010 (dotted line in Figure 5.28(A)). AF's market diversification experienced two plateau phases, the first during 2001—2004, and the second 2005—2008. However during these two periods, exports had an upward trend

which suggests that AF intensified its market penetration in current markets (dotted line in Figure 5.28(B)). Market penetration was intensified due to the growth of current customer's demand in each market. Finally, the number of certifications accrediting AF showed a slight growth between 2000—2010 (dotted line in Figure 5.28(C)).

Model Testing Procedures

Confidence in the model was gained by applying a series of recommended and accepted tests for system dynamics models (Morecroft, 2007). I applied two validations: *structure validation* and *behaviour validation*. Table 5.9 shows the statistics for validating the structure of the SD model developed by the CEO of AF.

Table 5.9: Statistics for assessing the SD model's structure validation for AF

<i>Description</i>	<i>Number of factors</i>
Number of variables in the model	26 variables
Number of variables introduced by the CEO	26 variables
Number of non real-world variables	0 variable
Number of variables with problems under extreme conditions	0 variable
Number of links in the model	36 links
Number of links introduced by the CEO	36 links
Number of delays in the model	0 delays
Number of delays introduced by the CEO	0 delays

Structure validation shows that variables and relationships are consistent with observations about the mental model of people who know the business well. In fact, the match was good because the SD model was developed by the CEO. In summary, all equations are dimensionally correct without the use of non real-world parameters (dimensional consistency). All parameters were suggested by Ismael (parameter verification), and simulations make sense under extreme conditions.

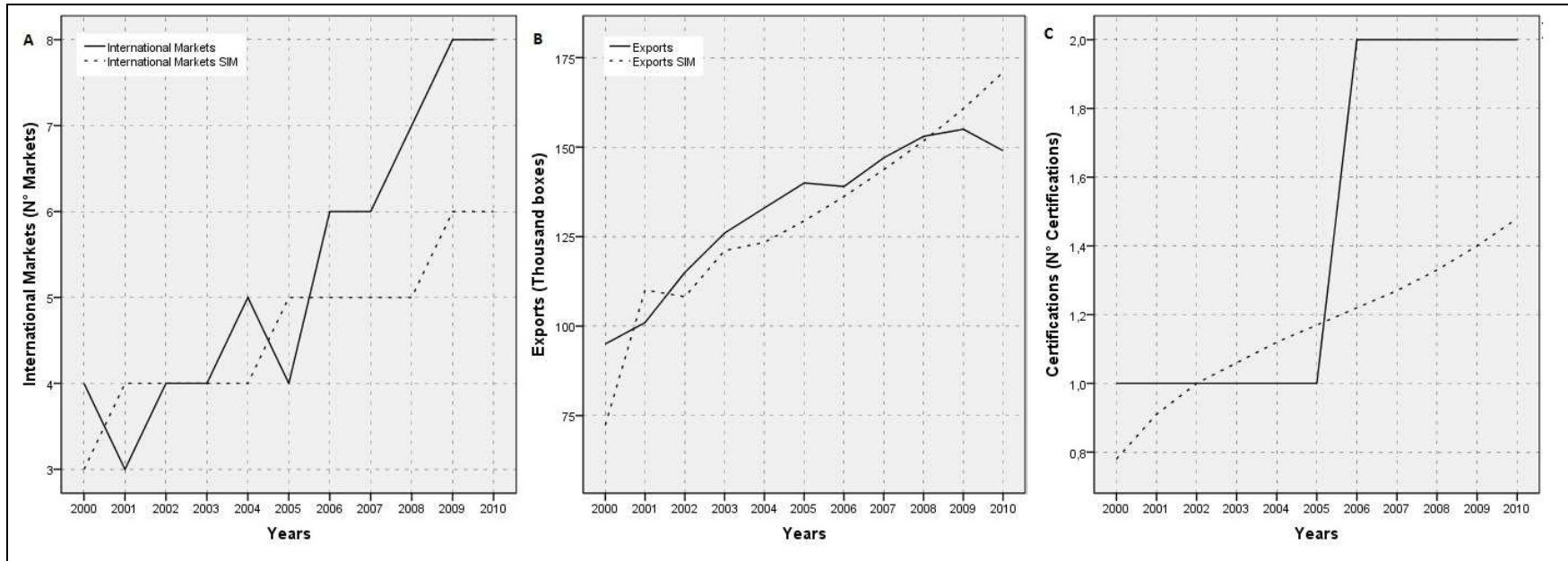


Figure 5.28: Historical fit for the three main variables at AF case.

On the other hand, there was a good quantitative fit in the base case which was consistent with the aim of SD modelling on reproducing the modes of behaviour (Taylor and Dangerfield, 2005). Table 5.10 provides a number of historical fit summary measures during 2001—2010.

Table 5.10: Statistics for assessing the SD model fit to data from AF case study

<i>Variable</i>	<i>MAE</i>	<i>MSE</i>	<i>Theil's inequality statistics*</i>			<i>R</i> ²	<i>N</i>
			<i>Bias</i>	<i>Unequal variation</i>	<i>Unequal covariation</i>		
International Markets	1.09	1.63	0.32	0.41	0.26	0.75	11
Exports	8.97	128·10 ³	0.04	0.38	0.58	0.84	11
Certifications	0.41	0.26	0.54	0.29	0.17	0.72	11

* The failure to sum to unity is due to rounding errors

The three variables analysed in Table 5.10 had high R^2 values. These values measure how well variables are likely to be predicted by the model. The MAE of *international markets* reached 1.09 markets. The 32 per cent of its MSE results from difference of means, showing a slight displacement of simulated data points. The MAE of *exports* is 8.97 thousand boxes. The bias of *exports* is low, only the 4 per cent of MSE is explained by difference in means. The 58 per cent of MSE is explained by point-by-point differences caused by a smooth cyclicity in the real data. Finally, the *certification* has the MAE equal to 0.41 certifications. The bias can explain more than the 50 per cent of its MSE.

Selecting Strategic Initiatives for Creating Scenarios

Table 5.11 shows the four strategic initiatives suggested by Ismael for improving performance. Two initiatives emerged from Steps 1 and 2 before the use of SD modelling. The remaining initiatives were suggested by Ismael during the session of strategy rehearsal (Steps 4). Ismael was interested in analysing the impact of his administration on the firm's performance. The analysis of increasing exports considered two initiatives (1) increase the number of attendances at trade fairs and roundtables and (2) increase the capacity of

customer service. While the first strategy aims to increase the number of customers and markets, the second strategy focuses on decreasing the number of disaffiliated customers.

Table 5.11: List of strategic initiatives suggested by Ismael during the modelling

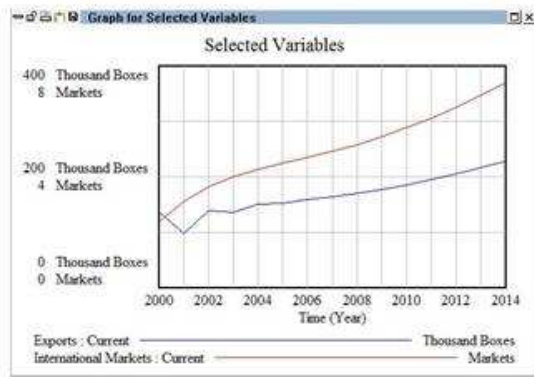
<i>Strategic Initiatives in AF</i>	<i>#</i>	<i>Step</i>	<i>Description</i>
Open a new brand	1	1	Open a new brand related to a specific niche market (onions and tubers).
Penetrate the Indian apple market	2	2	Penetrate the Indian apple market through exporting only premium apples.
Increment tasting exhibitions	3	4	Increment of attendance to events, such as tasting exhibitions and fruit roundtables.
Increment of customer service capacity	4	4	Increment of customer service capacity in those markets where AF is exporting more intensively.

The simulations analysed four scenarios: Scenarios 1 and 2 show the impact of the first strategy; Scenarios 3 and 4 show the impact of second strategy (Figure 5.29). These simulations motivated Ismael to discuss the firm's current strategy of internationalisation and its likely results. The dialogue provided opportunities for both assessing strategic ideas and learning from simulated performances.

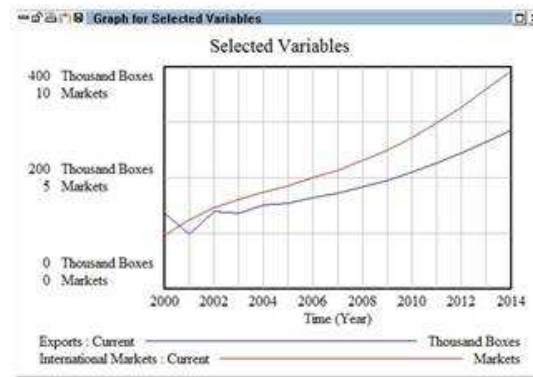
Scenario 1 assumed a 15 per cent increment of attendances at events, such as tasting exhibitions and fruit roundtables. At these events, Ismael can reach new customers and markets. Ismael attends as part of a group called *Federación Gremial Nacional de Productores de Fruta de Chile*. This is a cluster of fruit export firms that organises such events regularly. In this scenario, exports jumped by 2.03 per cent, and the firm's market diversification was not significantly affected (Scenario 1 only predicted an increment from 6 to 7 markets in 2012) compared to the base scenario¹¹.

¹¹Base scenario was run using historical data provided by Ismael.

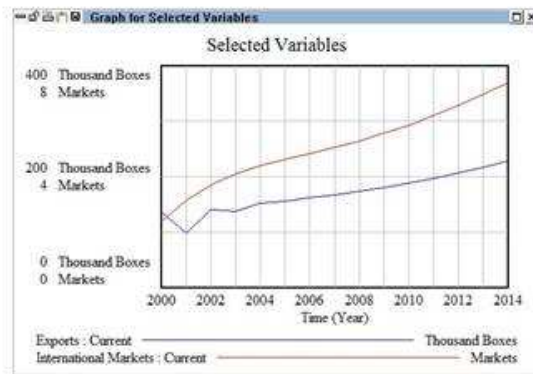
S1 : attendance to events = +15%



S2 : attendance to events = +60%



S3 : customer service capacity= +10%



S4 : customer service capacity= +40%

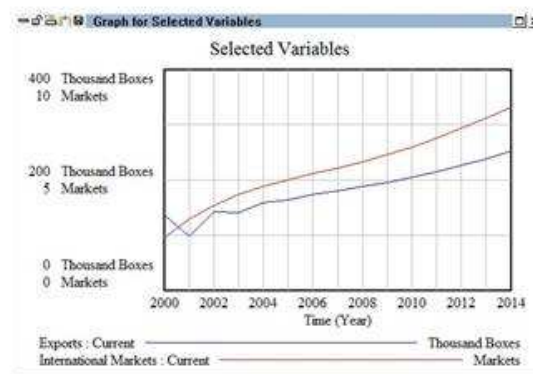


Figure 5.29: Four scenarios analysing the impact of two strategies on the AF's exports

Scenario 2 assumed a 60 per cent increment of attendances at events, such as tasting exhibitions and fruit roundtables. In this case, exports were incremented by 7.84 per cent compared to the base scenario, and 5.69 per cent compared to Scenario 1. Ismael argued that he is interested in following the strategy suggested by Scenario 2. In fact, he is analysing ways to enter the Indian market due to its high fruit demand. On the other hand, the simulation showed that at an assumed rate of 15 per cent, the market penetration had begun to rise from 2004 reaching the 8 markets by 2014. Both exports and the number of markets had upward trends during the whole simulation.

Scenario 3 assumed a 10 per cent increment of customer service capacity. This scenario shows an increment of exports by 3.34 per cent compared to the base scenario, but the market diversification was gradually affected, similar to that of Scenario 1. In 2005, 2009, and 2012 simulations showed an increment of one market compared to the base scenario. Ismael shared that AF is expanding its professional staff in order to improve the relationships with customers, specially those located in Europe and United States. He recognised that the firm depends on his father's skills for those negotiations with English-speakers, and that situation will limit the long-term growth of the firm.

Scenario 4 assumed a 40 per cent increment of customer service capacity. In this scenario, exports were incremented by 10.46 per cent compared to the base scenario, 2.43 per cent compared to Scenario 2, and 6.90 per cent compared to Scenario 3. Considering the exports variable, this simulation presents the best case scenario. Before simulations, Ismael thought that the best scenario would be the one that increments the rate of new customers and markets (the second one), because this is the traditional way to develop the internationalisation of small fruit companies. Nonetheless, Scenarios 2 and 4 show that the best strategy would be Scenario 4 because AF reaches the highest level of exports. Also,

this simulation showed that the market penetration began to rise in 2003, one year earlier than what Scenario 2 had proposed.

5.5.5 Evaluating the SD modelling in AF one year later

In this fruit company, the CEO resigned from the family business after three months of the modelling experience and started up a new export company. This situation was unexpected after the modelling. Therefore, I was unable to obtain data on this firm one year later because the new CEO did not accept an interview. However, I interviewed the former CEO five months later, and he expressed his acknowledgement for the new ideas which were discussed during the modelling. From this case study it is not possible to come to any kind of conclusion about the modelling, but it shows one of the risks of supporting a deliberate strategy in small organisations: SMEs are highly vulnerable to the discontinuation of strategic plans when the CEO leaves the organisation.

5.6 Supporting the Internationalisation of FT

The modelling of FT case focused on supporting the CEO's understanding of the firm's internationalisation process. Ignacio, the owner and CEO of FT participated in this doctoral project because he wanted to analyse the impact of commercial fishing on the regeneration of fish. In the section below, the individual case study report of FT is presented. This report shows the four steps of modelling in this fish company: (1) Conceptualisation, (2) Definition of Resource System, (3) Resource Development, and (4) Rehearsing Strategy.

5.6.1 Conceptualisation Process in FT

I started the meeting by asking the CEO to describe the development of his company's internationalisation. This general question permits me to grasp Ignacio's degree of un-

derstanding about the process. I will only show some main extracts of Ignacio's conceptualisation for exemplifying this process. This step took around 40 minutes of the first meeting.

Responding to my first question, Ignacio commented:

Quotation N 1

'We export through our own sales representative who is my business partner in Spain [...] we only export to Spain because we have all the infrastructure to control exports, from fisheries to Mercamadrid's stalls [...] In Spain, we sell our products through two ways, wholesales in Mercamadrid and retail sales to 13 fish stores within Madrid [...] We have these two ways because we export large amounts of fish, in fact in one month we have exported around 1.4 million kilograms of fish'.

The current internationalisation strategy of FT is direct exports to Spain (Quotation 1). In order to manage and control the delivery process there are five employees in the firm's headquarters located in Santiago. They have to control the logistics processes between the processing plants and the customers located in Spain. However, strategic decisions are made by the CEO, especially related to when, to whom, how, how much, and what to export. Ignacio's business partner has several stalls in Mercamadrid¹² to wholesale. Additionally, FT sells products to 13 fish retailers located within Madrid. Another strategy used by FT was to obtain Foreign Direct Investment (FDI) for funding some projects related to increasing the capacity of their processing plants in Chile.

Figure 5.30 shows some statistics of the FT's internationalisation. Graph 1 (from left to right) shows that FT has not implemented any kind of market diversification. They only focused on penetrating the Spanish market through exporting a great volume of austral hake, a demanded fish in Spain. The export of austral hake has had great success because

¹²Mercamadrid is the largest market in Europe for perishable foodstuffs. This market is located in Madrid and has a total of 176 hectares at the service of the 700 companies located there.

this fish is mostly extracted from southern Chile¹³, while the European hake, a direct substitute, has suffered an abrupt depletion in the last 20 years (Murua et al., 2010). In the last 10 years, even though austral hake price has had a sudden upward trend, the level of hake captured had some fluctuations with a clear downward trend (See Graphs 2 and 3 from left to right). Increments of industrial catch is one of the reasons why the population of austral hake has decreased dramatically.

Ignacio's response to question one led me to ask him to explain how he manages such large amount of exports. Ignacio commented:

Quotation N 2

'We have five fish processing plants [...] In Puerto Montt (X region, Chile) we have three plants, one industrial plant and two traditional plants, in Chacabuco (XI region, Chile) we have one traditional plant, and in Punta Arenas (XII region, Chile), we have another industrial plant [...] we control almost 90 per cent of Chilean austral hake [...] Although several industrial fisheries and fishermen are independent in financial terms, we control their production and the products they will export'.

FT has specialised in exporting austral hake from Chile to Spain, reaching more than the 90 per cent of the Chilean market share (Quotation 2). FT reached this colossal market share by developing plants, both traditional and industrial, in strategic locations where hake is caught. Moreover, Ignacio and his Spanish business partner involved both industrial fisheries and fishermen in order to control the major suppliers. The structure of FT's supply chain allows the firm to control both hake catch and potential competitors within this niche market. This last point triggered the question: *How could a SME develop and control these supply chain structures?*

¹³ Austral hake is also extracted from Argentina and New Zealand.

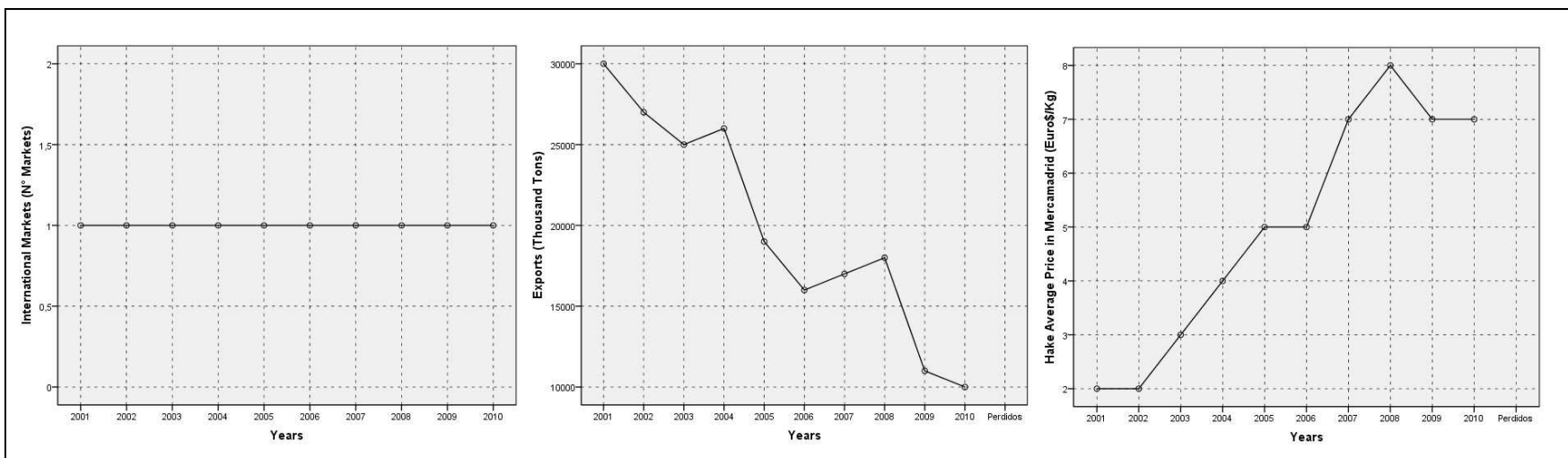


Figure 5.30: FT's statistics

Quotation N 3

‘We involved industrial fisheries and fishermen as suppliers of a fish highly demanded by the Spanish market [...] (also) we had foreign direct investments (FDI) from Spain in order to expand our plants’.

In order to speed up the development of new plants, FT has received foreign direct investments from Spanish investors who wanted to make sure that most of hake supplied from Chile arrive at Mercamadrid (Quotation 3).

5.6.2 Boundaries of the Resource System in FT

I asked Ignacio to map the internationalisation process by drawing it on a chart. While Ignacio was drawing the picture, I simultaneously explored the possible strategic resources perceived by him during the conceptualisation step.

In the first part of the description (superior side of Figure 5.31), Ignacio described the fish delivery process, from extraction to reception in Spain.

Quotation N 4

‘We have fish plants in the X, XI, XII regions [...] then we send the fish from fish plants to Santiago (Chile) and Buenos Aires (Argentina) by trucks [...] In both places, we load aircrafts to send the fresh fish to Spain [...] we opened a Cargo Agency in Argentina because in Chile we don’t have the logistic capacity to send our current amount of fish through airlines [...] In some cases when we have problems with the aircrafts’ capacity (Route: Santiago—Madrid or Buenos Aires—Madrid), we send the fish to Frankfurt (Germany) and we transport to Madrid (Spain) by trucks [...] In Germany, we bought trucks in order to be prepared for such events’.

Ignacio has the know-how of transcontinental food shipping processes (Quotation 4). This knowledge allows him to know that European standards for importing fresh food are

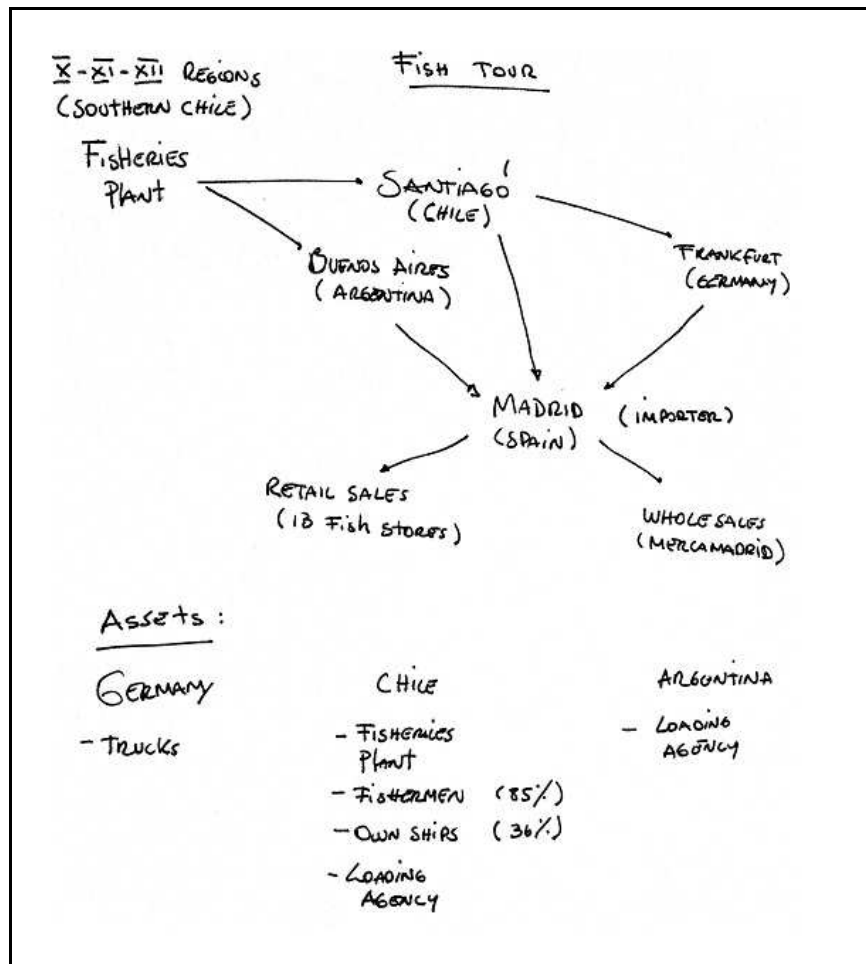


Figure 5.31: CEO's diagram of FT's internationalisation

highly strict, and a little delay can cause damage to his products. Hence, he focused on controlling the delivery at Santiago, Buenos Aires, and Frankfurt's airports because these places are critical for the success of sending fresh fish to Europe. In this step, he also highlighted his relationship with his Spanish business partner. Figure 5.32 shows FT's loading process where FT's employees are transferring the fish from trucks to aircrafts at Santiago's Airport.



Figure 5.32: Transferring the fish from trucks to aircraft at Santiago's Airport.

Quotation N 5

'In Spain, my business partner who possess several stalls in Mercamadrid sells the fish to wholesalers [...] he (also) manages the sales to 13 fish retailers located within Madrid [...] My business partner has almost 50 years of experience in the Spanish fish market'.

Ignacio's business partner possesses another kind of know-how, the knowledge of the Spanish demand (Quotation 5). This combined knowledge is one of the drivers of FT's successful internationalisation.

In the second part of the description (inferior side of Figure 5.31), Ignacio described the FT's main assets in Chile, Argentina, and Germany (Quotation 6).

Quotation N 6

‘In Chile, we have fish plants, fishermen who represent 85 per cent of our production capacity, [...] our ships make up 36 per cent of the global fleet [...] in Buenos Aires we have another cargo agency operated by an FT’s employee, and in Germany we have trucks with air coolers [...] For strategic reasons, in each country, I used different brands for my company’.

Once Ignacio has described FT’s main assets, I asked him about how he develops the dynamics of the customer portfolio. His answer is as follows:

Quotation N 7

‘Even though we have customers in Spain who buy our hake, we really export to ourselves, that means I export to my business partner and he is the importer [...] He (Ignacio’s business partner) negotiates with the customers directly and manages this relationship’.

Quotation 7 shows that Ignacio focuses on managing the catch and delivery from Chile to Spain, and his business partner manages the sales in Spain. This is not a traditional model of SMEs, but during a confidential session, Ignacio explained to me some of the reasons behind the decision to employ this model.

5.6.3 Resource Development in FT

Considering the following quotations of Ignacio, I illustrate the process of how the CEO identified potential strategic resources and their causal relationships. Here strategic resources are shown in **bold**, and their effects on the development of the other resources in *italics*.

Quotation N 8

‘Even though we know that we have to protect our main resource (**hake**) *during the harvest period we extract as much as we can*, otherwise, other companies (rivals) will take that fish [...] Spaniards demand large amounts of hake and pay a higher price than the Chilean market [...] we respect the hake ban (close season) during August but in the last years we have seen a dramatic decrease of the hake harvest’.

The main resource for this company is hake (Quotation 8). Ignacio recognises that the Spanish demand pushes FT to further increase the fish catch every year. However, in the last years, lower regeneration rates for hake have affected FT’s exports. In the long term, an unsustainable regeneration rate could cause an external crisis affecting not only FT, but all stakeholders involved in the process.

Quotation N 9

‘*In order to increase our exports*, we have invested in **fish plants**, **fishermen** and **industrial ships** in the last years [...] Our fleet (fishermen and industrial ships) allows us to expand the harvest activities in the southern coast of Chile [...] I invest in such resources based on my plan for growth’.

Investment in ships and fishermen is an individual decision of the CEO (Quotation 9). Two main factors affect these decisions: the CEO’s judgement about what he expects for his company in future, based on the organisation’s vision, and the information sources on which his decisions are based, such as the information provided by fish suppliers.

Figure 5.33 shows the CEO’s preliminary causal map drawn in session in which the CEO identified five relevant resources: *Industrial ships*, *Fishermen*, *Hake*, *Fish plants*, and *Transport*. During the next meeting, this model was slightly refined, however, the central

characteristics remained stable as shown in Figure 5.34.

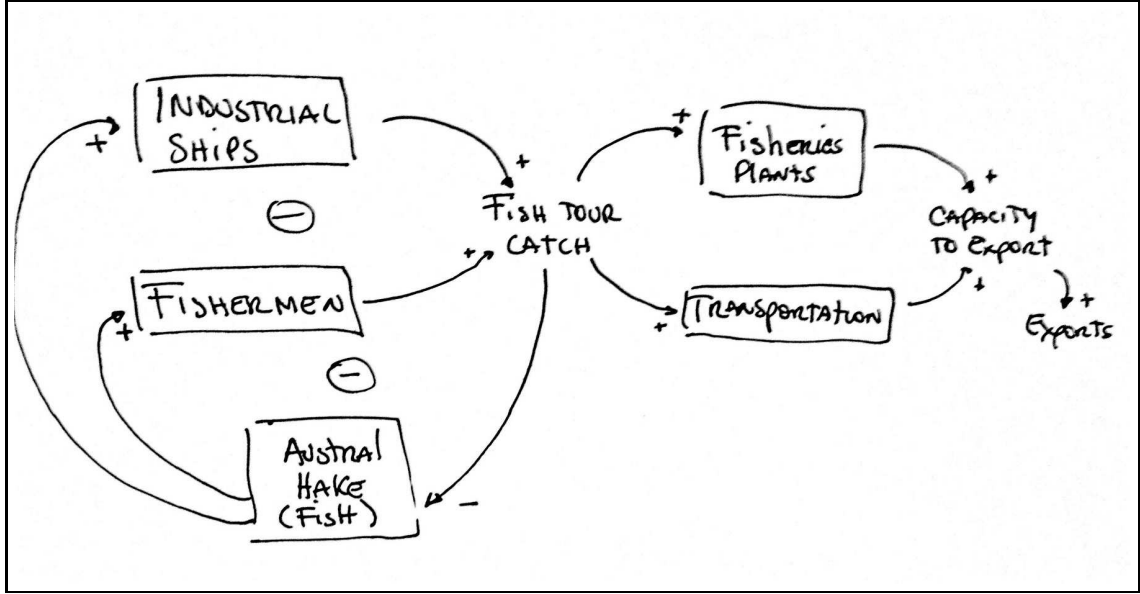


Figure 5.33: The CEO's preliminary causal map drawn in session

Figure 5.34 shows the final SD model developed using the VENSIM software. Here, the number of industrial ships Is_t in time t is defined as,

$$Is_t = Is_0 + \int_0^t Ps_t dt \quad (5.38)$$

The purchase of ships (Ps_t) in time t is the difference between the desired industrial fleet size (Ds_t) and the number of industrial ships (Is_t) divided by the time to adjust this fleet (τ_{as}) in time t ,

$$Ps_t = \frac{Ds_t - Is_t}{\tau_{as}} \quad (5.39)$$

The number of fishermen F_t in time t is defined in Equation 5.29 as,

$$F_t = F_0 + \int_0^t Nf_t dt \quad (5.40)$$

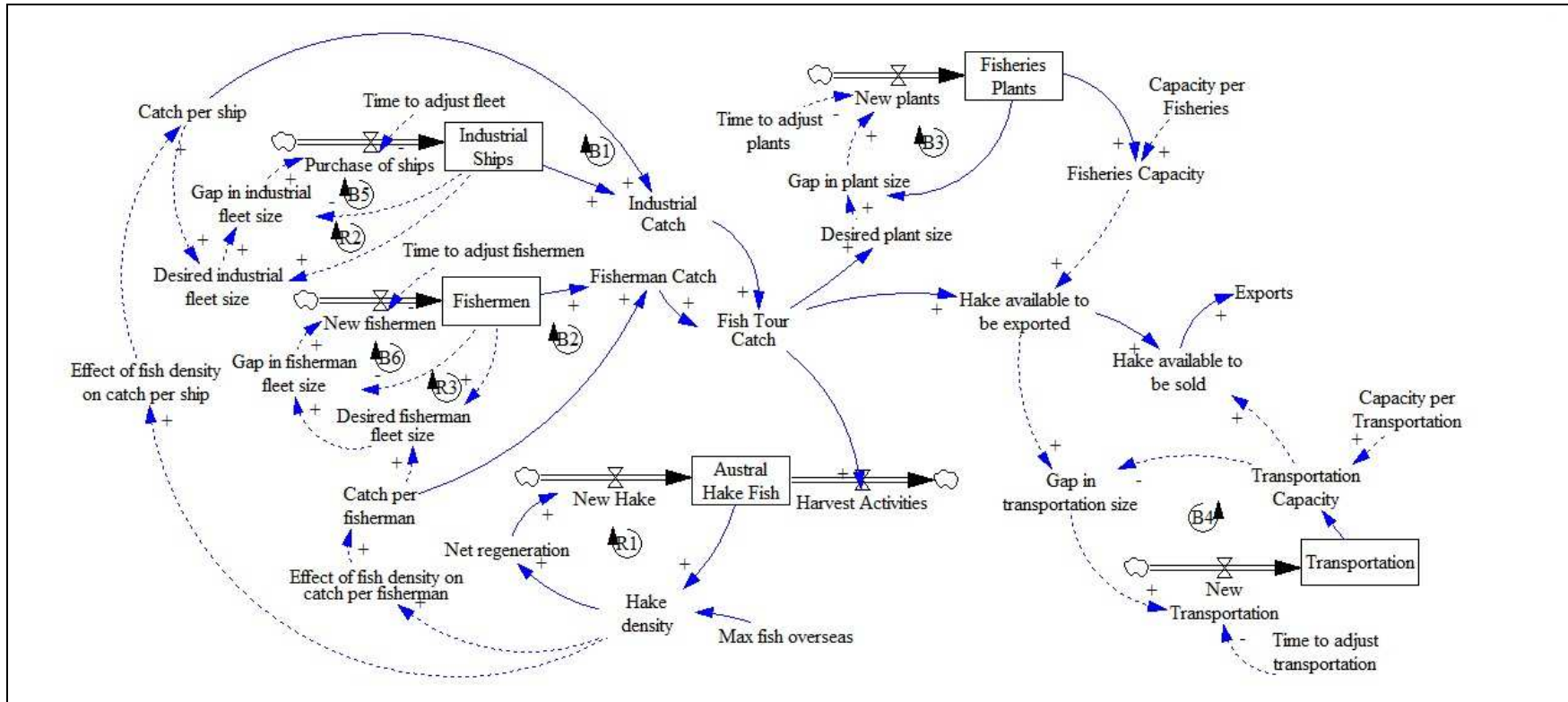


Figure 5.34: The CEO's view of the strategic resource system at FT using a SD model

New fishermen Nf_t in time t is the difference between the desired fisherman fleet size Df_t and the number of fishermen F_t divided by the time to adjust this fleet τ_f in time t ,

$$Nf_t = \frac{Df_t - F_t}{\tau_f} \quad (5.41)$$

The dynamics of the industrial ships (Is_t) and fishermen (F_t) play a central role in the regeneration of hake (Hf_t). If there is not a balance in catching hake, an exhaustion can be irreversible. The total catch of FT (Cft_t) in time t depends on the number of industrial ships (Is_t), fishermen (F_t), and their productivity (how many fish each ship ($Prod_{Is}$)/fisherman($Prod_f$) catches on a typical trip).

$$Cft_t = (Is_t \cdot Prod_{Is}) + (F_t \cdot Prod_f) \quad (5.42)$$

The number of hake Hf_t available to be caught in time t is defined as,

$$Hf_t = Hf_0 + \int_0^t (Nh_t - Ha_t)dt \quad (5.43)$$

Equation 5.32 formulated new hake (Nh_t) and the harvest activities (Ha_t) in time t as,

$$Nh_t = f(Reg_t) \quad (5.44)$$

$$Ha_t = Cft_t \quad (5.45)$$

I modelled the net regeneration (Reg_t) as a non-linear function of fish density (Morecroft, 2007). Using the approach of Morecroft's (2007) fishery dynamics model, I assumed a maximum number of fish available to be caught (α_{fs}) based on the information estimated by FT.

$$Reg_t = \frac{Hf_t}{\alpha_f s} \quad (5.46)$$

Ignacio also suggested that *transportation* (T_t) is another strategic resource. The transport (T_t) in the time T is defined as,

$$T_t = T_0 + \int_0^t Nt_t dt \quad (5.47)$$

New transportation (Nt_t) in time t is the difference between the desired transportation fleet size Dt_t and the number of trucks Ts_t divided by the time to adjust this fleet τ_T in time t ,

$$Nf_t = \frac{Dt_t - Ts_t}{\tau_T} \quad (5.48)$$

5.6.4 Rehearsing Strategy in FT

The Base Case Simulation

This base case provided the CEO with a strategic picture of the internationalisation process with a consideration of the dynamics of resources over a set period of time. The FT base case simulation was produced over a period of 10 years starting from 2001. Numerical data were available for the whole period between 2001 and 2010. Insight into the basic causes of the base case scenario was gained via a series of partial model test simulations. There is no certainty about the levels and regeneration rates of hake in Chile. Although there are some governmental agencies analysing and protecting sea resources in Chile, I could not get access to reliable data about the net population and regeneration of austral hake.

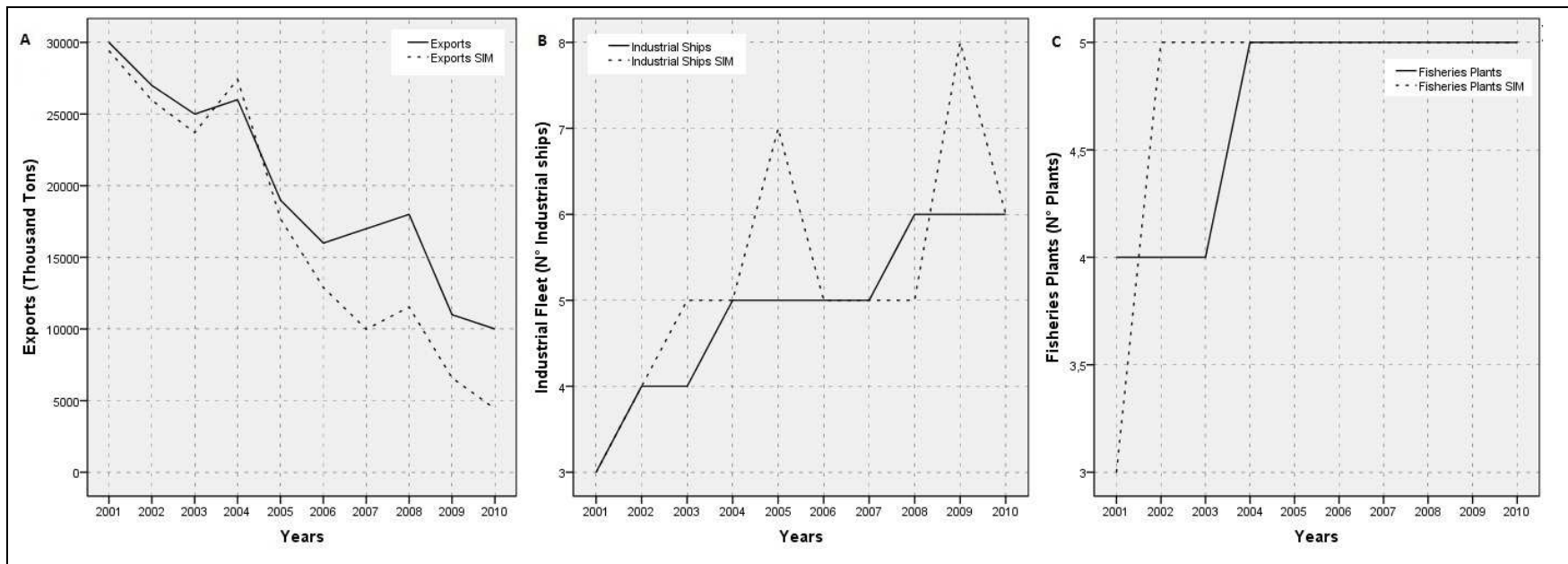


Figure 5.35: Historical fit for the three main variables at FT case.

For this reason I assumed a similar probability distribution of fish regeneration provided by Morecroft (2007). But values and standard deviation of this distribution function were hypothesised based on historical data and some of the CEO's assumptions. When it is not possible to define the relationship between a causal factor and its consequence in a simple mathematical relationship, Morecroft (2007) recommends displaying this relationship graphically if companies possess a good understanding of how variables are affected at different levels.

Simulation of the case base showed that exports had an downward trend with some fluctuations between 2000 and 2010 (dotted line in Figure 5.35(A)). In order to reverse the fall of exports, FT invested in industrial ships. The CEO indicated that the process of buying a new ship can take no longer than one year. For that reason, expansion of fleet had one year of delay (dotted line in Figure 5.35(B)). The number of plants experienced a growth in 2002, but after 2003, there was no further expansion in the number of plants (dotted line in Figure 5.35(C)).

Model Testing Procedures

Confidence in the model was gained by applying a series of recommended and accepted tests for system dynamics models (Morecroft, 2007). I applied two validations: *structure validation* and *behaviour validation*. Table 5.12 shows the statistics for validating the structure of the SD model developed by the CEO of FT.

Structure validation shows that variables and relationships are consistent with observations about the mental model of people who know the business well. In fact, the match was good, because the SD model was developed by the CEO. In summary, all equations are dimensionally correct without the use of non real-world parameters (dimensional con-

Table 5.12: Statistics for assessing the SD model’s structure validation for FT

<i>Description</i>	<i>Number of factors</i>
Number of variables in the model	39 variables
Number of variables introduced by the CEO	35 variables
Number of non real-world variables	0 variable
Number of variables with problems under extreme conditions	0 variable
Number of links in the model	49 links
Number of links introduced by the CEO	43 links
Number of delays in the model	4 delays
Number of delays introduced by the CEO	4 delays

sistency). Most of the parameters were suggested by the Ignacio (parameter verification), and simulations make sense under extreme conditions. In this case study, I only suggested four variables which were not considered by Ignacio: (1) Effect of fish density on catch per fisherman, (2) effect of fish density on catch per ship, (3) hake density and (4) maximum fish available to be caught. These four variables were added into the SD model based on the assumptions of the fishery dynamics model developed by Morecroft (2007). This facilitated the understanding of equations used for simulating the model. These intermediary variables did not affect the links, polarities, and loops suggested by the CEO.

On the other hand, there was a good quantitative fit in the base case which was consistent with the aim of SD modelling on reproducing the modes of behaviour (Taylor and Dangerfield, 2005). Table 5.13 provides a number of historical fit summary measures as described by Morecroft (2007).

<i>Variable</i>	<i>MAE</i>	<i>MSE</i>	<i>Theil's inequality statistics*</i>			<i>R²</i>	<i>N</i>
			<i>Bias</i>	<i>Unequal variation</i>	<i>Unequal covariation</i>		
Exports	3,220	$15 \cdot 10^6$	0.54	0.33	0.13	0.88	10
Industrial Fleet	0.7	1.3	0.19	0.05	0.76	0.51	10
Fish Plants	0.3	0.3	0.03	0.07	0.9	0.46	10

* The failure to sum to unity is due to rounding errors

Table 5.13: Statistics for assessing the SD model fit to data from FT case study

The R^2 are low for *industrial fleet* and *fish plants*, but they are significantly different from zero. *Industrial fleet* has a MAE of 0.7 ship and the 76 per cent of MSE arises from point-by-point differences caused by the peaks in 2005 and 2009 in the simulated data. In the real case, the increments of exports in 2004 and 2008 (which led to augmented industrial fleet in the simulation) were caused by the investment of new industrial ships in 2004 and 2008. *Exports* has a higher R^2 (0.88) which suggests a good fit to real data. The bias of exports is 0.3, reflecting the downward displacement of the simulated data points after 2005. The unequal covariation of *exports* is 0.9, meaning that 90 per cent of the MSE arises from point-by-point differences.

Selecting Strategic Initiatives for Creating Scenarios

Table 5.14 shows the three strategic initiatives suggested by Ignacio for improving performance. All of them emerged during the last meeting (step 4). The initiatives show that Ignacio is interested in protecting the supply chain through incorporating more industrial ships, and extending the harvest beyond the hake catch. Hake density has experienced a dramatic fall in the last 10 years causing several problems for the FT's exports, such as fishermen strikes, idle capacity of some resources, and unfulfilled shipments. These factors have hurt growth expectations and affected strategic plans.

Table 5.14: List of strategic initiatives suggested by Ignacio during the modelling

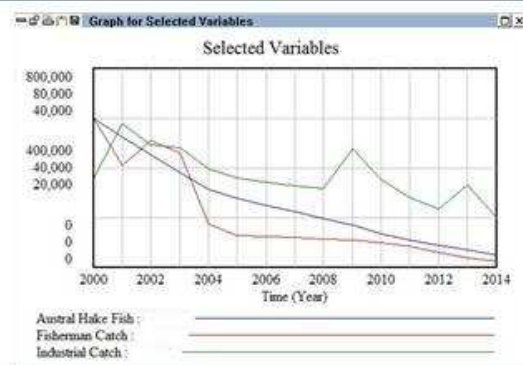
<i>Strategic Initiatives in FT</i>	<i>#</i>	<i>Step</i>	<i>Description</i>
Increment the industrial ship fleet	1	4	Increment the industrial fleet in order to protect the fish supply when fishermen strikes occur.
Plant (factory) outsourcing	2	4	Outsource fisheries plant services
Catch more varieties of fish	3	4	Extend the harvest beyond the hake catch within the same area of capturing.

As before, I only explored those ideas that the CEO wanted to analyse at this time during the simulation session. Ignacio was interested in analysing the impact of commercial fishing on the regeneration of hake. In the last 10 years, hake has experienced a dramatic decline due to industrial fishing and strong Spanish demand. Figure 5.36 shows four scenarios depending on the intensity of the catch and fish regeneration dynamics.

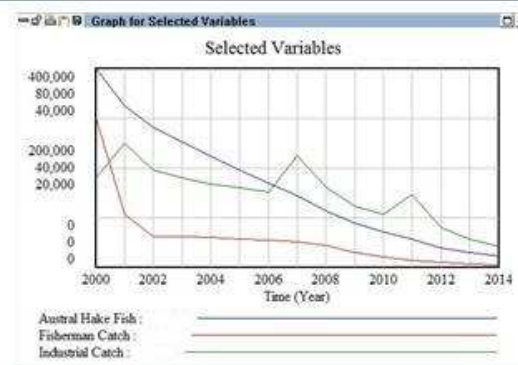
Scenario 1 assumed a full hake population in 2000 ($t = 0$ for the simulation). In this case, the dynamics of catch show that both industrial ships catch (green line) and fishermen catch (red line) compete for extracting higher rates of hake during the first three years. As a result, the hake stock (blue line) begins to fall. When the hake population decreases, the rivalry dynamics between industrial ships and fishermen is increased. However, industrial ships have higher levels of productivity than fishermen (capacity to extract hake per year), therefore, after 2003 industrial ships dominated the harvest activities. In 2004, the abrupt fall in fishermen catch allowed industrial ships to increase their catch. This increment in the industrial fleet pushed catch beyond a tipping point that caused a rapid decline in the regeneration rate and the fish stock.

Scenario 2 assumed a 60 per cent hake population in 2000 ($t = 0$ for the simulation). This scenario shows that in 2001, the initial expansion of industrial catch (green line) caused a significant decrease in the fishermen catch (red line). The downward trend of the hake stock in this scenario is higher than in Scenario 1 because the 40 per cent hake shortage encourages FT to speed up its investment in industrial ships. This investment in ships caused a rapid decline in the number of fishermen between 2000 and 2002. After 2003, simulations showed a lower but stable number of fishermen. This decline period in fishermen allowed two industrial fleet expansions in 2007 and 2011. These expansions increased the catch, and consequently, decreased the hake stock.

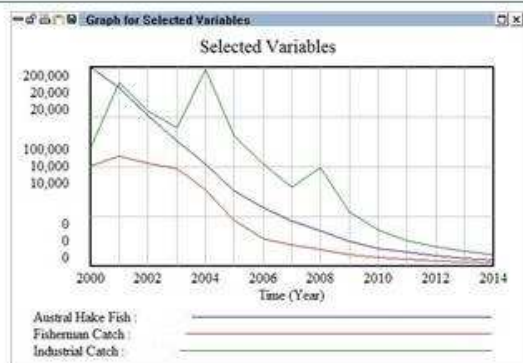
S1 : Full Hake population (t=0)



S2 : 60% Hake population (t=0)



S3 : 30% Hake population (t=0)



S4 : 1% Hake population (t=0)

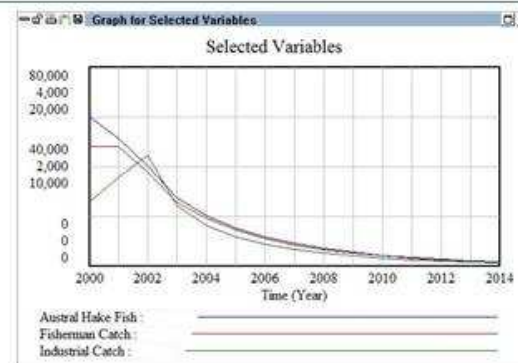


Figure 5.36: Four scenarios depending on the strength of catch and fish regeneration dynamics

Scenario 3 assumed a 30 per cent hake population in 2000 ($t = 0$ for the simulation). Ignacio identified this scenario as the one closest to his company's current situation. Even though this SD models assumed 2000 as $t = 0$ to run simulations, the industrial harvest of hake began in the 1990's. Hence, the assumption of a rate around 30 per cent is realistic. In this case, the initial expansion of both industrial catch (green line) and fishermen catch (red line) in 2001 caused a slight decrease in the number of ships and fishermen between 2001 and 2003. Then the rapid expansion of industrial ships in 2004 caused a dramatic decrease in the fish stock. This tipping point in 2004 affected that the dynamics of hake stock, industrial ships, and fishermen, all of which experienced downward trends. An interesting point was observed in 2008, where the model showed an increase in industrial fleet. In this year, FT invested in the industrial fleet as a consequence of the higher price of hake in Spain and a strike of Chilean fishermen. One of the reasons the fishermen went on strike was to denounce the industrial ships who were devastating the fish stocks in the southern coast of Chile.

Scenario 4 assumed a 1 per cent hake population in 2000 ($t = 0$ for the simulation). This scenario shows that industrial catch (green line) had a growth between 2000 and 2002, but later the industrial catch as well as the fisherman catch had a downward trend. Even though the industrial fleet and fishermen were reduced, it was not possible to reverse the hake decline and the fish stock collapsed at the end of the simulation (2014).

5.6.5 Evaluating the SD modelling in FT one year later

During 2011 and 2012 fishermen's strikes have caused several problems to FT. The main problem is the reduction of fish stock. However, this problem is also affecting other fish firms in Chile. Figure 5.37 shows protest by fishermen in the south of Chile. They are demanding a stronger regulation to industrial catch and larger fishing quotas for fishermen.

Scenario 3 of the FT case (Chapter 5) was identified by the CEO as the closest one to reality.



Figure 5.37: Fishermen's protests demanding new regulations between industrial catch and fishermen's catch

In this scenario, industrial catch dominates the fish harvest and the fishermen experience a dramatic reduction of fishing quotas. In fact, from the analysis emerged the possibility that it would not be possible to reverse the hake decline and that the fish stock would collapse after 2014 which was the end of the simulation. Unfortunately, this scenario is happening, and the consequences of the decline of fish stock is affecting the Chilean fish companies, as well as all the people involved in this industrial activity (fishermen, fish stores, and their families). One year later, the CEO restructured the whole organisation. They sold their fisheries plants and industrial ships and outsourced the fish catch. These decisions were triggered as a consequence of the internal financial crisis between years 2010

and 2012 due to the fall in the number of exports.

5.7 Summary of the Key Findings of Chapter 5

Chapter 5 discusses how five CEOs of small companies conceptualised an internationalisation strategy based on their mental models of the firm's resource system. Research Question 2 was tackled by showing how five CEOs develop an internationalisation strategy in a small organisation. Although the CEOs formulate and implement the internationalisation strategy, they (1) do not fully understand variables, feedback relationships, delay effects involved in the strategy process, and often (2) do not notice all the information within their field of vision. When CEOs face an iterative process to refine their mental models, it is possible to reach a clear representation that shows the dynamism of the strategy process. Chapter 2 suggested that SD modelling can support the internationalisation strategy of small organisations by modelling and rehearsing the CEO's mental model of the firm's resource system. The modelling process consisted in facilitating the identification of strategic resources, causal relationships among resources, time delay effects, and feedback processes involved in the internationalisation process by building a SD model. Simulations from the SD model provide the CEO with a tool for both assessing strategic ideas and learning from simulated performance. Both the modelling and rehearsing of strategy addressed Research Question 3.

In SD modelling, there are five basic structures in articulating a problem: stocks, flows, variables, causal relationships among variables (links), and loops (Sterman, 2000). Table 5.15 shows the summary of SD elements identified in the four steps of the modelling (e.g., Resource conceptualisation, boundaries of the resource system, resource development, and strategy rehearsal).

Table 5.15: Summary of the elements and initiatives described by CEOs to develop an internationalisation strategy

CEOs' identification	Modelling Process		
	Steps 1-2	Step 3	Step 4
<i>Structure of SD models</i>			
Resources (Stocks)	9	12	0
Flow Variables	15	17	0
Auxiliary Variables	39	14	0
Causal relationships	46	59	0
Loops	14	18	0
Delays	2	4	0
<i>Strategy rehearsal</i>			
Initiatives	4	2	10
Scenarios ^α	0	0	4

^α The number of scenarios was agreed with the CEOs

The five CEOs identified 9 resources in Steps 1 and 2, and 12 in Step 3. That indicates that through SD modelling the CEOs were able to identify more resources than by using a simple description of the internationalisation strategy. The analysis of the inflow and outflow variables provides new insight into how CEOs develop resources over time. During Steps 1 and 2, 15 flow variables were identified by CEOs, but in step 3, 17 flow variables were identified. This result proposes that the use of SD modelling enhances the analysis of the structure that causes changes in the stocks. Changes in the level of resources take place only gradually through flow rates (Kunc and Morecroft, 2007b). Most of the auxiliary variables used in the models were identified in Steps 1 and 2 (39 variables). This finding suggests that CEOs have a good understanding of the main factors which affect their internationalisation process. Formal SD modelling allowed the identification of causal relationships to increase incrementally from 46 links to 105 links in the five models developed by the CEOs. The identification of more causal links indicates that

CEOs after the modelling represent the internationalisation process in a more detailed way, and therefore, they now have a more detailed understanding of what is involved in business internationalisation (Schaffernicht and Groesser, 2011). The feedback loops identified by CEOs were highly related to how each CEO develops his or her strategic resources when carrying out the internationalisation. The SD modelling allowed CEOs to increase the identification of feedback loop structures involved in the internationalisation process. However, SD models (stock-and-flow diagrams) had a disadvantage when portraying loops because they require CEOs to understand how loops operate with the additional symbolic notation, which some people find challenging (Warren, 2004). For that reason, the use of causal diagrams during Step 3 was useful in overcoming the notational confusion. Finally, using SD modelling, CEOs identified a greater number of delay relationships which affect the internationalisation process. Often, modellers sketch such relationships in consultation with the management team, either on a whiteboard or directly on to computer so the diagram is visible for inspection and comment (Morecroft, 2007). However, the case studies provide evidence that CEOs are able to identify by themselves delays effects and the dialogue which emerged from this conversation can be used to discuss potential implications of delays in decision-making.

The five CEOs perceived their preliminary mental models (Step 2 of modelling) *as facts* rather than sets of assumptions. In fact, in the beginning of the meetings, they were not open to having their world views challenged. Hence, simulations were fundamental to opening up the discussion about the current strategy and its likely outcomes. When CEOs saw that the simulations were closer to real data, they were more interested in discussing their own queries about the internationalisation process (10 strategic initiatives emerged in Step 4). Four scenarios were analysed from the strategic initiatives suggested by the CEOs. In the wine industry, Juan (LR) and Irene (IW) suggested seven strategic initiatives for

improving performance. All initiatives were unique, but they can be applied to other wine companies with similar resources and idiosyncrasy. In the fruit industry, Felipe (CT) and Ismael (AF) suggested six strategic initiatives. Half of these initiatives emerged during the formal modelling sessions using SD (Steps 3 and 4). The initiatives show great diversity in the actions that fruit companies can pursue for improving performance abroad. Finally, Ignacio (FT) identified three initiatives during Step 4. Here, the initiatives showed that Ignacio was interested in protecting the supply chain.

Finally, simulations of the potential scenarios showed an impressive closeness to reality one year later. This finding suggests that simulations based on CEO's mental models allow for the assessment of real scenarios. However, firm's benefits of modelling the internationalisation strategy are not direct. Although Juan, Irene, Felipe, and Ignacio analysed at least one scenario which was close to reality, only Juan and Irene followed the initiatives analysed for simulations and had a sales growth. In contrast, Felipe and Ignacio did not develop any kind of activity to overcome flaws of strategy and consequently sales decreased.

Chapter 6

Mental Models of Internationalisation

6.1 Introduction

Chapter 6 addresses Research Question 4: *Are the CEO's mental models of the same internationalisation strategy similar in those firms with similar resources?* by comparing and discussing the CEO's mental models of the internationalisation strategy developed by Juan (LR), Irene (IW), Felipe (CT), Ismael (AF), and Ignacio (FT). These mental models (expressed as SD models) were depicted by CEOs during the facilitated modelling process (Chapter 5). The comparative analysis presents the causal structures behind the common strategic resources, and provides evidence of the similarities in the cognitive patterns that lead to an internationalisation strategy across companies.

Chapter 6 is divided into three sections. Section 6.2 shows a qualitative analysis of the CEOs' mental models (key resources and their feedback effects). Interesting links from the qualitative analysis are contrasted with the literature of small business studies. Section 6.3 details the quantitative analysis of the CEO's mental models. This analysis compares

the degree of difference between two SD models at three levels: (1) variables, (2) loops (feedback and delay effects), and (3) the whole model. This comparative method presented in Chapter 3 allows the development of a robust answer to Research Question 4. Finally, Section 6.4 presents a summary of the key findings of Chapter 6.

6.2 Qualitative Analysis of the Mental Models

This section zooms into the qualitative details of the five SD models. The SD models developed by the five CEOs provide interesting facts that can be contrasted with the literature on strategy, especially the literature related to the internationalisation of small businesses. In Chapter 5, Figures 5.5, 5.13, 5.20, 5.27, and 5.34 exhibit the SD models developed in LR, IW, CT, AF, and FT. Causal patterns (causal links among these resources) allow an understanding of how mental structures of the resource system affect the internationalisation. Although the literature on international small businesses is rich in identifying the strategic resources which can improve performance, the five case studies identified four common resources: *customer portfolio*, *CEO's experience*, *production (products)*, and *communication technology*. This short list suggests that the process of identification and development of strategic resources could explain heterogeneous performance among similar international SMEs.

6.2.1 Customer Portfolio Development

In the literature of strategy, scholars do not consider customers as a resource because customers are not productive assets owned by the firm (Grant, 2008). However, four CEOs (LR, IW, CT, and AF) perceive customers as an intangible resource because it can be managed and used for improving performance. At LR, the CEO explained that the development of the customer portfolio is based on his experience and technological abilities.

In this case, customer portfolio is affected by two positive (or reinforcing) loops (R4 and R2) (Figure 5.5 in Chapter 5). Reinforcing loop R4 shows that the wine firm increases its marketing activities to gain customers in an international market, and the number of new customers help the firm to predict the production for next year. The CEO's experience in making wine for new customers in international markets allows him to further increase his marketing activities, but this time, with a focus on those new markets reached by the firm in the last year. Reinforcing loop R2 demonstrates the relationship between the firm's communication systems and marketing activities. International marketing activities increment the growth in new customers through e-business.

When wine companies aim to reach sophisticated customers, those able to pay higher prices for wines, traditional marketing activities prove to be less effective. Since sophisticated customers are interested only in premium and award wines, the balance between an increase in sales without losing exclusivity is central for premium wine's internationalisation strategy. The case of IW shows that a small production capacity impacts the firm's relationship with customers in two ways. Firstly, if the number of customers increases sharply, the firm may have problems with expanding the production beyond their current capacity and financial sources. Secondly, the wines can lose exclusivity.

In the case of the fruit industry, international customers are wholesalers interested in large quantities of fruit. For that reason, exporting firms must show good standards of products and processes. In Figure 5.27 (Chapter 5), reinforcing loop R1 shows that Ismael invests in international standards (e.g., ISO9000 and Global Gap) as a assurance of quality of his firm's fruits and processes. These standards allow him to access to new customers in international markets that demand such certifications. Increments in the number of customers are limited to the firm's service capacity of managing agreements. A balancing

loop (B1) affects the dynamic of customers similarly to the LR and IW case studies. AF has a limited fruit stock per year, therefore, an abrupt growth of customers could cause stock shortage, and as a consequence, a fall in the number of customers. In contrast, Felipe (CT) suggests that although some certifications are important to export fruit, the drivers of attracting new customers (brokers) are the experience and the networking of CEOs.

6.2.2 The CEO's Experience Development

Juan (LR) argued that the CEO's experience is the most critical resource for the firm, a view broadly supported by international business scholars (Hambrick and Finkelstein, 1995; Van Den Heuvel et al., 2006). Nonetheless, Juan expands this concept beyond the traditional roles of (1) *control* (e.g., select new managers, determine management's responsibilities and salary) and (2) *service* (e.g., build reputation, network, formulate and implement strategies) in SMEs (Van Den Heuvel et al., 2006). Juan emphasises that for small wine companies which compete by differentiation, the CEO should also pay attention to wine tasting trends across countries to develop unique wines. Reinforcing loop R3 shows how this dynamic capability is developed by Juan. A similar finding emerged from the IW case study. Irene (IW) is one of the most experienced wine-makers in Chile. Her success is not only attributed to her skills in producing wine, but also her deep understanding of the customer's needs and preferences. She understands very well her competitive environment. She knows the challenge of the Chilean wines is to have good quality, but more affordable than French wines. Her mental model (SD model) includes price as a central variable of the internationalisation process. Figure 5.13 (Chapter 5) shows how Irene has increased the price paid by customers for her premium wines. The positive (or reinforcing) loop (R4) suggests that IW increases its taste exhibitions to gain customers in premium wine segments. In such events, Irene also attempts to understand the specialist's preference.

This learning process increments Irene's experience leading to improvements in quality based on the specialist's tastes. The wine quality of IW has been awarded several times in Chile as described in Chapter 5. Awards have a considerable impact on wine prices. Simultaneously, increments the number of customers able to pay higher prices. Awards also encourage current customers to praise a recommend quality of the IW's wines. These recommendations increase the IW's customer portfolio (R1). While wine price is a relevant factor in every firm, the mental models in most of the cases did not pay attention to this area. This suggests that when CEOs consider the *prices* as part of their mental model of internationalisation, they can theorize the mechanism behind increments of prices, and therefore they are able to improve this critical factor.

On the other hand, experience can be developed through several generations as part of a family strategy. For example, Ismael belongs to a family of agriculturists who have learnt the fruit business dynamics through repetitions of what their fathers have done well. Part of the international experience was transferred from Ismael to his son Ismael at AF. This knowledge leads Ismael to design actions that have reinforced internationalisation activities of the firm in the last years. Experience increases product customizations, international orientation, e-business activities, and opportunity recognition, essential components for reaching new international customers (Figure 5.27).

When a small firm is starting up, opportunity recognition is a central concept within their strategies (Short et al., 2010). Many factors have been found to influence opportunity recognition, including prior knowledge of a field or industry, entrepreneurs' social networks, and a wide range of cognitive factors, such as attributions and intentions (Baron and Ensley, 2006). Felipe (CT) is a clear example of an entrepreneur who took advantages of an opportunity to develop his international business. He has prior knowledge

of the fruit industry, friends (networking) who contacted him potential brokers, and interest in developing business abroad. Felipe identified two kind of experience: *producing fruit* and *developing exports*. His experience in producing fruit enhances the quality of his products. Quality improvements lead to positive assessments of the CT's fruit, and these recommendations allow the firm to reach more international brokers. In this case, brokers play the role of customers. They buy CT's fruit and re-sell to small fruit retailers in foreign markets. Most of the time, brokers belong to the same geographic region where the fruit is sold. On the other hand, experience in exporting fruit reinforces the growth of international brokers. Often brokers in fruit industries introduce other brokers located in different geographic areas (Reinforcing Loop R1 in Figure 5.20). However, while Felipe argued that experience affects the whole internationalisation process, he did not consider experience as a strategic resource. This can suggest that young entrepreneurs are not sure whether their knowledge and experience are a valuable, rare, and difficult to imitate resource. At early internationalisation phases, differentiation strategies are more emergent than deliberate, and therefore, the accumulation of experience is not considered by the CEO's mental models. FT's model provided another explanation to why experience was not counted as a strategic resource. In rare cases, when one company controls most of the 90 per cent of extraction, exports, and sale abroad of a particular natural resource-based product highly demanded (monopolistic situation), the CEO's prior experience helps to structure the whole internationalisation process, but it is not considered as part of the resource system. Therefore, although Ignacio gains experience through exports, he does not develop this resource as part of his internationalisation strategy.

6.2.3 Production Development

Commodity industries, such as agriculture, aquaculture and mining tend to be plagued by price wars and low profits because products of rival firms are virtually indistinguishable (Grant, 2008). However, international small firms cannot compete with large multinational companies by reducing price. Thus, small firms try to differentiate their products through quality. For example, an external consulting firm provides AF with recommendations for improving quality at the level of product and process. This certified quality allows LR to obtain necessary accreditation to export fruit internationally.

In an industry where products are differentiated, such as wines, established firms possess the advantage of brand recognition (Grant, 2008). At LR, innovations are focused on improving wine quality through training programmes. Most of the time, these activities involve innovations in wine's varieties. In the same way, Irene suggested that wine quality has a strong qualitative component related to the customer's preference. These two SD models (LR and IW) suggest that if a small wine company only focuses on those quantitative components of wine quality, such as building material of storage (*guarda*), terroir, and grape quality, the wine's quality superiority is not sufficient to guarantee growth in customers. For that reason, both models show a tight relationship between customers and production.

The development of products is also determined by prior experience of CEOs. In Chapter 5, I commented that Felipe started up his new venture as a result of his recognition of two opportunities: (1) He met an international broker interested in buying his dried plums, and (2) he was able to collect fruit from agriculturists who did not export. Both opportunities are tightly linked to his mental model. The dynamics of the plum production are affected by the firm's capacity to produce and collect dried plums from its own land

and from external agriculturists. If Felipe increases the number of plums purchased from external agriculturists, the quantity available to be exported would augment. However, the firm's small production and collection capacity affects the relationship with agriculturists, because if the number of plums jumps too quickly, the firm may have problems with managing a collection process beyond their current capacity and financial resources. Balancing loop B2 allows the CEO to identify and select those agriculturists who are more efficient and loyal in providing plums (Figure 5.20 in Chapter 5).

From FT, Ignacio's mental model of production is highly connected to his prior experience of working in the logistics department of an airline. He recognises the critical factor in the business of fresh fish is to control the supply chain. By controlling the whole supply chain, FT can manage and control the logistic process of shipping fresh fish to Spain. In fact, this case study supports those findings provided by Lu and Beamish (2001) which concluded that a key strategy for overcoming the resource limitations that frequently constrain an SME's expansion is the use of FDIs granted by business partners. FT has received FDIs for incrementing the number and capacity of fisheries plants. Both factors increase the amount of fish available to be exported. However, the process of building a new plant takes time. Balancing loop B3 reflects the costs and benefits associated with the decision to increase the number of plants (Figure 5.34 in Chapter 5).

6.2.4 Communication Technology

Kim et al. (2011) suggest that the customer orientation of Born-Global¹ leads to innovativeness through technological capabilities for customer relationship management (CRM) and external customer information management. The conceptual framework developed by Kim et al. (2011) emphasises that technological capability for CRM is a mediator between

¹Born-Globals are also known as international new ventures or international SMEs (See Chapter 2).

customer orientation and innovativeness. At LR, e-business activities, such as contacting potential customers, making agreements, and promoting products using the Internet, push the firm to acquire new communication systems and technologies for servicing customers. Acquiring new technologies reinforces the growth of new e-business capabilities (Reinforcing loop R2 in Figure 5.5, Chapter 5). The CEO perceives e-business capabilities to be critical for understanding customers' preferences which lead to develop new innovation in products.

In Chile, most SMEs use internet technologies to render value chains more transparent for consumers and producers (Kleine, 2008). The internet can be used to develop international marketing activities (e.g., LR) or to search and select specialist segments of customers and retailers. In Figure 5.13 (Chapter 5), reinforcing loop R2 shows how Irene links e-business activities with the customer portfolio development in order to reach sophisticated customers. These contacted customers give feedbacks on where the firm can host tasting exhibitions in different countries. Wine varieties attract an increasing number of specialist retailers to tasting events. New specialist retailers represent a source of new knowledge about potential specialist segments and markets abroad. However, the physical distance between Chile and international markets located in Europe and Asia encourages IW to use communication technologies intensively. Reinforcing loop R3 in Figure 5.13 shows that contacted customers motivated the firm to acquire communication systems, such as emails, fax, telephones, mobiles and video-streaming. Dynamics of communication systems reinforce the growth of new customers and retailers through good e-business practices.

6.2.5 Summary of Qualitative Analysis

The qualitative analysis showed that four common resources were identified by the CEOs during the modelling process. Table 6.1 presents the resources which were reviewed in

Section 6.2 and classifies them as valuable (V), rare (R), and difficult-to-imitate (I) resource (Barney, 1991). Additionally, Table 6.1 shows the interrelated links between the resource and its drivers which were identified by the five CEOs in their SD models (Figures 5.5, 5.13, 5.20, 5.27, and 5.34 in Chapter 5). Only the *product* was identified by all CEOs as a resource. However, natural resource-based products such as, wine, fruit, and fish are valuable but not rare and difficult-to-imitate resources.

On the contrary, the *CEO experience* was identified by three CEOs as a resource but *CEO experience* can be classified as a strategic resource because it is a VRI resource under a RBV (Alvarez, 2007; Crick, Chaudhry and Batstone, 2001). The *CEO experience* allows the small firm to compete in global markets where products are not unique and limited – a finding aligned to the results presented by the econometric analysis in Chapter 4. The qualitative analysis suggests that the *CEO experience* directly affects the firm’s marketing activities, opportunity recognition, international orientation, product development, network, and product quality; and it is affected by the production development (technical experience), and the firm’s negotiation with intermediaries and customers (business experience). Both technical and business experiences are relevant to developing unique capabilities that allowed the firm to earn a rate of return in its capital that exceeds its cost of capital over the long term (Grant, 2008).

Communications technology was identified as a relevant resource by the CEOs of wine companies because it allows the firm to develop e-business activities. Both wine firms suggest that difficult-to-imitate combinations of managerial, functional, and technological skills are dynamic capabilities developed by CEOs that give their firms a competitive advantage over competitors in their target markets (Teece et al., 1997).

Table 6.1: Common resources identified by the Juan, Irene, Felipe, Ismael, and Ignacio in their SD models

Resources	Firms					RBV theory			Interrelated Findings	
	LR	IW	CT	AF	FT	Resources			affects to	is affected by
						V	R	I		
Customer portfolio	✓	✓	✓	✓		✓	✓		Production Sales Customer preference Marker diversification	Communication Systems CEO experience Intermediaries (brokers, retailers) Network Marketing activities Country brand
CEO experience	✓	✓		✓		✓	✓	✓	Marketing Activities Opportunity recognition International orientation E-business Product Customisation Network Product quality	Production Intermediaries (brokers, retailers) TMT size Marketing activities
Production	✓	✓	✓	✓	✓	✓			Sales CEO experience Storage Transportation	Customer portfolio Product Quality Harvest (or catch) External Advising
Communication technology	✓	✓				✓			E-business	Technology investment

Finally, *customer portfolio* was identified as a resource by four CEOs. *Customer portfolio* can be defined as an intangible, valuable, and rare resource when the firm manages the relationships with customers in order to increase sales growth (Tuli et al., 2010). An exceptional case was exhibited by FT where the firm controls most than the 90 per cent market share (Chilean hake). SMEs involved in a monopolistic situation is a rare case. However, FT has developed a competitive advantage in the hake market by focusing on controlling both the supply chain management of the hake, and the sales points – through a business partner in Spain.

6.3 Quantitative Analysis of the Mental Models

This section illustrates the process of comparing the five SD models by using the analytical method developed by Schaffernicht and Groesser (2011). As discussed in Chapter 3, this comparative method analyses the degree of similarities between mental models of dynamic systems. When two SD models are relatively complex in terms of the number of strategic resources, factors, influences, and time delay effects, the comparison is not straightforward because these elements represent different levels of description within a mental model. Schaffernicht and Groesser (2011) identified three levels of description: (1) elements, (2) loops, and (3) models. These elements have been compared firstly between models within each industry and then across all firms analysed in Chapter 5.

6.3.1 SD Models of Wine Industry

As I explained in Chapter 3, the Chilean wine industry has been commonly recognised for achieving great success in exports. This phenomenon might be explained by *external factors*, such as the availability of grapes, special environmental conditions, and the wine global attractiveness, and by *internal factors*, such as the replacement of old production

methods with new technology, managerial practices and experiences, and characteristics of the management team. SD models developed by Juan (LR) and Irene (IW) show how CEOs' mental models link some of these elements to implement an internationalisation strategy. This section compares similarities between causal links, delays, and feedback process underlying mental structures of these two CEOs (Figures 5.5 and 5.13 in Chapter 5).

In the wine industry, two SD models of the SME internationalisation were analysed: LR and IW. The loop set of LR contains seven loops; IW contains six loops. Each loop is assigned a unique identification number and a name which represents the content of this loop. The information concerning each loop's polarity, the number of delays and the number of links is used to determine the distance between loops. Table 6.2 summarises all the loops and their characteristics.

Table 6.2: List of feedback loops of models related to the SME internationalisation within the wine industry

<i>Model</i>	<i>Loop</i>	<i>#</i>	<i>Name</i>	<i>Polarity</i>	<i># of delays</i>	<i># of links</i>
LR	R1	1	Recommendations	+	0	2
LR	R2	2	Com. Systems	+	0	3
LR	R3	3	Production	+	2	8
LR	R4	4	Experience	+	2	7
LR	R5	5	Marketing	+	0	2
LR	B1	6	Lost Customers	—	0	3
LR	B2	7	Sales	—	1	7
IW	R1	8	Recommendations	+	0	2
IW	R2	9	Com. Systems	+	0	2
IW	R3	10	Experience	+	0	6
IW	R4	11	E-business	+	0	9
IW	B1	12	Lost Customers	—	0	3
IW	B2	13	Sales	—	0	2

By establishing correspondences between the loops in both models, I analysed the content of loops in each model. The loop's content describes the mechanism which helps the CEO to understand a specific part of the internationalisation process. For example, both CEOs

identified that recommendations from current customers to potential ones reinforce the growth in customers. These relationships are expressed in loops 1 and 8. Loops 1 and 8 have the same number of links and delays. While loops 4 and 10 show the role of the CEO's experience in developing the internationalisation, loop 4, described by Juan, is more complex (Juan uses 7 links to describe the influence his experience has on his firm's internationalisation, while Irene suggests only 6 links). This analysis is not only semantic, but is based on what CEOs formulated during the interview.

I suggest that loops 1 and 8, as well as loops 4 and 10 are identical on a semantic level and can be compared. The correspondence between the other loops of LR and IW is established in the same way, with the exception of loop 5. Loop 5 is unique and therefore cannot be reasonably matched to any loop of IW. This loop expressed that the development of marketing activities increases the CEO experience in internationalisation, and new experiences rise marketing activities still more. IW has only premium wines and is smaller than LR. These differences can explain why Irene did not consider a loop between marketing activities and experience. At the level of premium wines, wine companies offer limited stock of bottles and marketing activities are based on awards rather than traditional wine advertising.

$$L = \begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix} \quad (6.1)$$

Consequently, the cells $[l_{1,8}, l_{2,9}, l_{4,10}, l_{6,12}, l_{7,13}]$ of the loop matrix L have a value of 1. In other words, five loops of LR and IW are identical ($L_c = [1 = 8, 2 = 9, 4 = 10, 6 = 12, 7 = 13]$; $L_{uLR} = [3, 5]$; $L_{uIW} = [11]$). These five pairs of loops are used to calculate the loop distance ratios (LDRs) using Equation 3.17 (Chapter 3). Matrix L represents the correspondences of the feedback loops between LR and IW models. In order to calculate the loop distance ratios, I defined and calculated matrices LR and IW of each loop. The adjacency matrix $LRi_{(xxv)}$ and $IWi_{(xxv)}$ contains all variables of both models (LR and IW). The results of the distance ratios are provided in Table 6.3.

Results suggest that models LR and IW differ significantly from one another. The application of this approach which explicitly accounts for delays feedback loops and the

Table 6.3: Loop distance ratios (LDRs) between the two models related to the SME internationalisation within the wine industry

<i>Loops</i>	<i>Idd</i> η (%) 0.33	<i>Lpold</i> ι (%) 0.33	<i>EDR</i> κ (%) 0.33	<i>LDR</i> (%)
1 – 8	0	0	0	0
2 – 9	0	0	83.3	27.5
4 – 11	15.38	0	98.48	37.58
6 – 12	0	0	90	29.70
7 – 13	11.11	0	97.62	35.88
3	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100
5	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100
10	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100

polarities of loops, reveals that only one pair of loops can be considered identical (Loops 1 and 8). Although Loops 2-9, 4-11, 6-12, and 7-13 were close to 25 per cent, they are over the range of values to be considered as similar (see Chapter 3). By using Equation 3.18, one ascertains that the model distance ratio between both models is $MDR(LR, IW) = 53.83\%$. Therefore, both models can be considered as dissimilar. However, further insights can be gained from Table 6.4. This table offers a summary of the main variables presented in models LR and IW. The distance ratios developed by Schaffernicht and Groesser (2011) only considered the variables and links within causal loops. However, SD models can include auxiliary variables which are not necessarily part of a loop. Therefore, in Table 6.4 I included all variables and links presented including those which were not part of the loops in both models.

Analysing similarities using Table 6.4, Irene (IW) could identify more variables and links than Juan (LR) did. When the analysis only considers loops, the increment in the number of variables was 13.33 per cent and 29.41 per cent in the number of links. These results suggest that the SD model developed by Irene can be considered as more complex. However, Juan identified one loop more than Irene did. If the analysis considers the total number of variables and links identified by both CEOs, Irene's model is larger in

Table 6.4: Additional indicators for comparing models related to the SME internationalisation within the wine industry

<i>Item</i>	Unique to			Common	
	<i>LR</i>	<i>IW</i>	<i>Complexity*</i>	<i>Identical</i>	<i>Different</i>
Variables (L**)	3	5	−13.33%	10	2
Model Variables	8	15	−30.43%	13	2
Resources	2	1	20%	4	0
Links (L)	12	17	−29.41%	5	0
Model Links	20	25	−15.62%	12	0
Loops	2	1	14.28%	0	5

*Complexity has been measured as the growth in variables and links between model LR and IW (%)

**L means that only it has counted the number of variables or links within loops.

terms of variables (30.43 per cent) and causal links (15.62 per cent) than Juan’s model. The number of resources perceived by CEOs as relevant was one of the initial questions. Both CEOs identified four similar resources: *experience*, *products* (their varieties of wines), *communication systems*, and *customer portfolio*. However, the *TMT size* and the *languages* spoken by the CEOs are two strategic resources identified only by Juan. Since the volume of exports and the number of international markets explored by LR are larger than IW, Juan needs more managers to keep and expand the number of international activities abroad.

6.3.2 SD Models of Fruit Industry

Chapter 3 suggested that the Chilean fruit industry is characterised by dominant family firms which have owned the land and possessed production expertise for many generations. These kind of firms usually have simple products and are controlled by buyers who derive power from high purchasing volumes. In this industry, the SD models were developed by CEOs who are also owners of their fruit firms. This section compares similarities between causal links, delays and feedback process underlying mental structures of Felipe (CT) and Ismael (AF) (Figures 5.20 and 5.27 in Chapter 5). I used the method developed by Schaffernicht and Groesser (2011) which was described in Chapter 3. In the fruit industry, two SD models of the SME internationalisation were analysed: CT and AF. The loop set of

CT contains four loops; AF contains five loops. Each loop is assigned a unique identification number and a name which represents the content of this loop. The information concerning each loop's polarity, the number of delays and the number of links are used to determine the distance between loops. Table 6.5 summarises all the loops and their characteristics.

Table 6.5: List of feedback loops of models related to the SME internationalisation within the fruit industry

<i>Model</i>	<i>Loop</i>	<i>#</i>	<i>Name</i>	<i>Polarity</i>	<i># of delays</i>	<i># of links</i>
CT	R1	1	New Customers	+	0	3
CT	R2	2	Production	+	0	2
CT	B1	3	Lost Customers	−	0	2
CT	B2	4	Lost Agriculturists	−	0	3
AF	R1	5	New Customers	+	0	3
AF	R2	6	Production	+	0	3
AF	R3	7	Quality	+	1	9
AF	R4	8	Experience	+	0	3
AF	B1	9	Lost Customers	−	0	3
AF	B2	10	Balancing Production	−	0	3

By establishing correspondences between the loops in both models, I analysed the content of loops in each model. The loop's content describes the mechanism which helps the CEO to understand a specific part of the internationalisation process. For example, both CEOs identified a reinforcing loop affecting the new customers dynamics, these relationships are expressed in loops 1 and 5.

Even though both loops 1 and 5 have the same number of links, loop 1 is reinforced by the CEO's experience in developing the export process, and loop 5 is reinforced by the brand reputation measured by the number of certifications, such as *ISO9000* and *Global Gap*. On the other hand, loops 2 and 6 show how CT and AF increment exports respectively. CT produces and collects fruit to increase exports, while Ismael only produces fruit using his land. Firm size and land size are two variables which can explain the difference in both firm's production process. Felipe can reach higher levels of exports only incrementing

the amount of fruit collected from external agriculturists because he has limited financial resources that hinder him from expanding his farm. Hence, I conclude that loops 2 and 6 as well as loops 1 and 5 are identical on a semantic level and can be compared. The correspondence between the other loops of CT and AF is established in the same way. Loops 4, 7, 8, and 10 are unique and therefore cannot be reasonably matched to any other loop. Loop 4 expresses how CT manages their agreements with agriculturalist. Loop 7 shows how Ismael increases quality through an external advisor. He perceives that improvement in quality is one of the drivers to reach new customers. Loop 8 highlights the role of the CEO's experience in the internationalisation process. Finally, loop 10 shows how Ismael manages the production. Although Felipe identified a reinforcing loop (1) which links the CEO's experience to the number of customers, Ismael did not connect this relationship in a feedback loop. As such, these two loops cannot be compared.

$$L = \begin{bmatrix} 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix} \quad (6.2)$$

Consequently, the cells $[l_{1,5}, l_{2,6}, l_{3,9}]$ of the loop matrix L have a value of 1. In other words, five loops of CT and AF are identical ($L_c = [1 = 5, 2 = 6, 3 = 9]$; $L_{uCT}=[4]$;

$L_{uAF} = [7, 8, 10]$). These three pairs of loops are used to calculate the loop distance ratios (LDRs) using Equation 3.17 (Chapter 3). Matrix L represents the correspondences of the feedback loops between CT and AF models. In order to calculate the loop distance ratios, I have defined and calculated matrices CT and AF of each loop. The adjacency matrices $CTi_{(v xv)}$ and $AFi_{(v xv)}$ contains all variables of both models (CT and AF). The results of the distance ratios are provided in Table 6.6.

Table 6.6: Loop distance ratios (LDRs) between the two models related to the SME internationalisation within the fruit industry

<i>Loops</i>	<i>Idd</i> η (%) 0.33	<i>Lpold</i> ι (%) 0.33	<i>EDR</i> κ (%) 0.33	<i>LDR</i> (%)
1 – 5	0	0	90	29.7
2 – 6	0	0	100	33
3 – 9	0	0	83.3	27.5
4	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100
7	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100
8	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100
10	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100

Results suggest that models CT and AF are significantly different from one another. The application of this approach which explicitly accounts for delays feedback loops and the polarities of loops, reveals that none of the loops can be considered identical. Although loops 3-9 were close to 25 per cent, the LDR(3,9) was over the range of values to be considered as similar (see Chapter 3). Furthermore, by using Equation 3.18, one ascertains that the model distance ratio between both models is $MDR(CT, AF) = 70.02\%$ (models can be considered as dissimilar). However, additional insightful statements are possible utilizing Table 6.7. This table shows a summary of the main variables presented in models CT and AF. The distance ratios developed by Schaffernicht and Groesser (2011) only considered the variables and links within causal loops. However, SD models can include auxiliary variables which are not necessarily part of a loop. Therefore, in Table 6.7 I added

all variables and links presented including those were not part of the loops in both models.

Table 6.7: Additional indicators for comparing models related to the SME internationalisation within the fruit industry

<i>Item</i>	Unique to			Common	
	<i>CT</i>	<i>AF</i>	<i>Complexity*</i>	<i>Identical</i>	<i>Different</i>
Variables (L**)	5	12	−77.78%	2	2
Model Variables	14	17	−13.04%	6	3
Resources	1	2	−33.33%	1	1
Links (L)	9	18	−81.81%	2	0
Model Links	24	31	−24.13%	3	2
Loops	1	3	−50%	0	3

*Complexity has been measured as the growth in variables and links between model CT and AF (%)

** L means that only it has counted the number of variables or links within loops.

Using the LDR analysis, Ismael (AF) identified more variables (77.78 per cent), resources (33.33 per cent), links (81.81 per cent) and loops (50 per cent) than Felipe (CT) did. Ismael also developed a model which was more complex than the model developed by Felipe. However, there was a decrease in the difference between the number of variables and links identified by both CEOs. For example, the difference between the number of identified variables was reduced from 77.78 per cent to 13.04 per cent. Regarding the difference in the number of links, this dropped from (81.81 per cent) to (24.13 per cent). Only *production* and *customers* were identified as common strategic resources in this industry. Factors, such as business year, and CEO's experiences and tenure could offer an explanation to the differences.

6.3.3 SD Models of Fish Industry

The natural conditions of the Chilean coast represent a great advantage for fish firms. In Chile, fishermen and industrial fish firms extract fish from the sea. FT uses both fishermen and industrial ships for catching hakes. Ignacio (FT) recognised six feedback loops related to these two strategic resources (Loops 2, 3, 4, 5, 8, 9 in Figure 5.34 in Chapter

5). Although the fishermen and industrial ships are affiliated with and contribute to FT increment FT's catch, they compete with each other for catching hake in the southern coast of Chile. This SD model identifies a large number of balancing loops than reinforcing loops. Balancing loops 3, 4, 5, 6 show Ignacio's efforts to achieve and maintain specific goals related to the desired industrial and fisherman fleet, number of plants, and number of transportation (Figure 5.34). Table 6.8 summarises how the causal relationships affect the FT's internationalisation strategy.

Table 6.8: List of feedback loops of the model related to the SME internationalisation within the fish industry

<i>Model</i>	<i>Loop</i>	<i>#</i>	<i>Name</i>	<i>Polarity</i>	<i># of delays</i>	<i># of links</i>
FT	R1	1	Fish regeneration	+	0	4
FT	R2	2	Industrial ship planning	+	1	4
FT	R3	3	Fisherman planning	+	1	4
FT	B1	4	Industrial ship catch	−	1	7
FT	B2	5	Fisherman ship catch	−	1	7
FT	B3	6	Fisheries plants	−	1	3
FT	B4	7	Transportation	−	1	4
FT	B5	8	Balancing industrial ships	−	1	3
FT	B6	9	Balancing fishermen	−	1	3

6.3.4 SD Models across industries

Using information provided by Tables 6.2, 6.5, and 6.8, I calculate the model distance ratio of each pair of comparison among SD models (Table 6.9). This section analyses the five SD models of the SME internationalisation: LR, IW, CT, AF and FT. The loop set of LR contains seven loops; IW contains six loops; CT contains four loops; AF contains five loops; and FT contains nine loops. Each loop is assigned a unique identification number and a name which represents the content of this loop. Also, Table 6.9 shows the number of variables, delays and links involved in each loop. In these five case studies, CEOs identified 32 loops, of which 17 were reinforcing loops and 15 balancing loops. 85 variables

and 105 links were described to explain the mechanism of these loops. Only 6 delays were identified within these 32 loops. The analysis for comparing SD models is based on comparing individual loops as separated elements (or loop distance ratios). The sum of all variables and links shown in Table 6.9 are higher than the arithmetical sum of the variables and links included in the models because some loops considered same variables or links twice or more times

Table 6.9: List of feedback loops of models related to the SME internationalisation in all case studies

<i>Model</i>	<i>Loop</i>	<i>#</i>	<i>Name</i>	<i># of vari- ables</i>	<i># of delays</i>	<i># of links</i>
LR	R1	1	Recommendations	2	0	2
LR	R2	2	Com. Systems	3	0	3
LR	R3	3	Production	8	2	8
LR	R4	4	Experience	7	2	7
LR	R5	5	Marketing	2	0	2
LR	B1	6	Lost Customers	3	0	3
LR	B2	7	Sales	7	1	7
IW	R1	8	Recommendations	2	0	2
IW	R2	9	Com. Systems	2	0	2
IW	R3	10	Experience	6	0	6
IW	R4	11	E-business	9	0	9
IW	B1	12	Lost Customers	3	0	3
IW	B2	13	Sales	3	0	3
CT	R2	15	Production	2	0	2
CT	B1	16	Lost Customers	2	0	2

Table 6.9 – Continued

CT	B2	17	Lost Agriculturists	3	0	3
AF	R1	18	New Customers	3	0	3
AF	R2	19	Production	3	0	3
AF	R3	20	Quality	9	1	9
AF	R4	21	Experience	3	0	3
AF	B1	22	Lost Customers	3	0	3
AF	B2	23	Balancing Production	3	0	3
FT	R1	24	Fish regeneration	4	0	4
FT	R2	25	Industrial ship plan- ning	4	1	4
FT	R3	26	Fisherman planning	4	1	4
FT	B1	27	Industrial ship catch	7	1	7
FT	B2	28	Fisherman ship catch	7	1	7
FT	B3	29	Fisheries plants	3	1	3
FT	B4	30	Transportation	4	1	4
FT	B5	31	Balancing industrial ships	3	1	3
FT	B6	32	Balancing fishermen	3	1	3

In order to analyse how similar or different these causal links are among the strategic resources across the five case studies, I used the same approach developed by Schaffernicht and Groesser (2011). Table 6.10 highlights that there is no evidence to assume that SD models across these five companies can be considered as *identical* or *similar* (all MDRs are higher than 25 per cent). The operationalisation of these MDRs is detailed in Appendix D.

Although most of these loops are associated with similar strategic resources as suggested in Section 6.2, the SD models of the resource system are dissimilar. This result is because these structures were built based on individual experiences, and the consequences of these experiences led to different development of resources over time. Models have more similarities within industries than across industries. For example the model distance ratio in the wine industry was 53.83 per cent ($MDR(LR, IW) = 53.83\%$) and in the fruit industry was 70.02 per cent ($MDR(CT, AF) = 70.02\%$). The only exception was the comparison between IW and AF, which had 69.87 per cent of difference. The model developed within the fish industry showed the highest difference compared to the wine and fruit industry ($MDR(LR, FT) = 97.97\%$, $MDR(IW, FT) = 100\%$, $MDR(CT, FT) = 97.47\%$, and $MDR(AF, FT) = 97.83\%$).

Table 6.10: Model Distance Ratios (MDRs) between the whole models related to the SME internationalisation in the wine, fruit and fish industries

#	Model	MDR (%)
1	$LR - IW$	53.83
2	$LR - CT$	74.25
3	$LR - AF$	70.14
4	$LR - FT$	97.97
5	$IW - AF$	69.87
6	$IW - CT$	81.87
7	$IW - FT$	100
8	$CT - AF$	70.02
9	$CT - FT$	97.47
10	$AF - FT$	97.83

6.3.5 Summary of Quantitative Analysis

The quantitative analysis showed that the SD models developed by the five CEOs are dissimilar (all MDRs are higher than 25 per cent). SD models represent the structure of

mental models which guides the CEOs to formulate and implement an internationalisation strategy (Nadkarni and Perez, 2007). The quantitative analysis suggests that mental models are highly related to the CEO's experience, a finding aligned to the results of the qualitative analysis.

In the wine industry, the model distance ratio was $MDR(LR, IW) = 53.83\%$. This MDR suggests a high degree of dissimilarity between both SD models of internationalisation. Even though both CEOs are wine-makers, and have the same background (Agronomist Engineer with a MBA), they have faced different experiences which led to different development of resources over time.

In the fruit industry, the model distance ratio was $MDR(CT, AF) = 70.02\%$. The MDR of the fruit industry is higher than the MDR exhibited by the wine industry. In this case, both CEOs are technical experts in developing the harvest, but they have a significant difference in the years of business experiences and tenure (Ismael (AF): 22 years of experience and 8 years of tenure; Juan (CT): 10 years of experience and 2 years of tenure).

The model developed by Ignacio (FT) showed the highest degree of differences with those developed in the wine and fruit firm. Three factors explain such differences: (1) CEO's experience (Ignacio is the most experienced manager in the five cases), (2) the characteristics of the fish industry, and (3) the monopolistic situation exhibited by FT.

6.4 Summary of the Key Findings of Chapter 6

Chapter 6 answers Research Question 4: *Are the CEO's mental models of the same internationalisation strategy similar in those firms with similar resources?* by performing a

qualitative and quantitative analysis of the CEO's mental models of the internationalisation strategy developed by Juan (LR), Irene (IW), Felipe (CT), Ismael (AF), and Ignacio (FT). The qualitative analysis suggests that four common resources were perceived by the five CEOs as relevant for superior performance by the firm (e.g., *customer portfolio*, *CEO's experience*, *production (products)*, and *communication technology*). However, the interrelated links between these resources and their drivers are conceptualised differently by CEOs with similar backgrounds who manage similar firms (same industry, similar size, and located within the same geographic area). For example, Figure 6.1 shows two different loops of the same strategic resource (CEO's experience). At LR, Juan suggested that the CEO's experience leads to the firm developing more marketing activities to reach new customers in international markets. The learning acquired from negotiation with customers increases the experience of the CEO still more. In contrast, Irene (I-wine) argued that the CEO's experience leads the firm to develop better quality wines. Wine quality increases the chances of getting awards which are used to reach new customers. Although both CEOs connected causally *customers* and *experience*, their mental models of the resource system are different, and therefore the resource accumulation will be developed differently. This vision does not deny the fact that resource heterogeneity and imperfect mobility across firms can cause competitive advantages, but supplements the RBV by stating that the perception that CEOs have over strategic resources also cause differences in small business performance.

On the other hand, the quantitative analysis shows that the five CEOs had different mental models of the best internationalisation strategy to pursue. All comparisons of SD models exhibited a MDR above 50 per cent. Results from both the qualitative and quantitative analyses suggest that the CEO's mental model is highly related to the CEO's

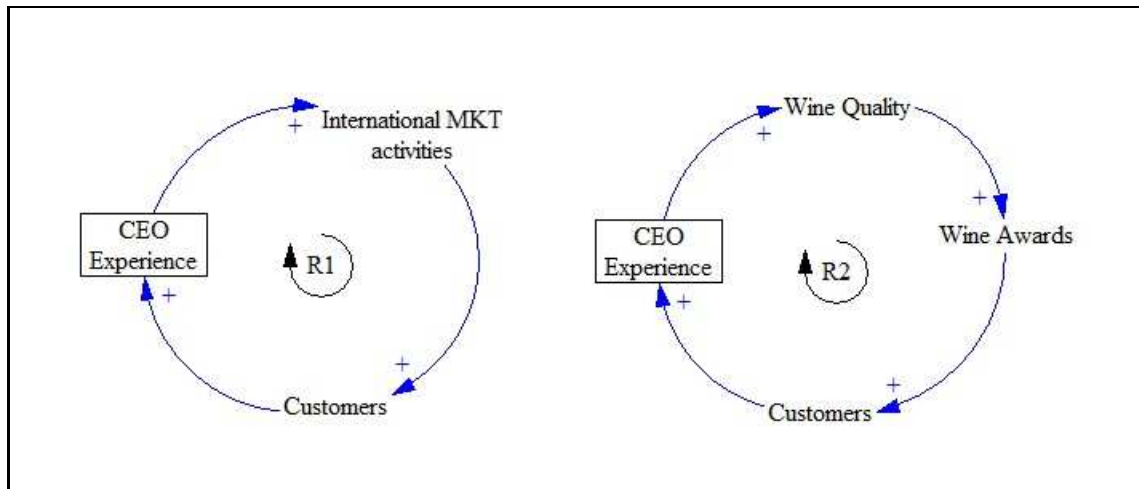


Figure 6.1: Different resource conceptualisation. R1 was identified by Juan (LR wine company); R2 was identified by Irene (IW wine company)

experience – a finding aligned to the RBV theory. Through experience CEOs develop unique capabilities that allowed their firm to achieve a superior performance (Grant, 2008). The comparative analyses of the resource systems have contributed to explain why similar firms can perform differently. Comparative analyses (Qualitative and Quantitative) of SD models of the internationalisation opens up a new way of debating internationalisation strategies and their potential outcomes for firm performance.

Chapter 7

Discussion

7.1 Introduction

Chapter 7 discusses how the findings that have emerged from Chapters 4, 5, and 6 answer Research Questions 1, 2, 3, and 4. The arguments are built in four stages and each one is based on the findings from the econometric analysis and case study research. Firstly, Section 7.2 – *Discussing RQ1: The CEO and the SME Internationalisation* – discusses the findings about how the CEOs affect the export intensity of SMEs located in Chile. Secondly, Section 7.3 – *Discussing RQ2: The CEO's Resource Management* – examines the findings about how the CEOs link strategic resources and their source of competitive advantage (Kunc and Morecroft, 2010). Thirdly, Section 7.4 – *Discussing RQ3: Supporting the SME Internationalisation Strategy* – discusses findings reported by Chapter 5 that related to the supporting strategy development of small organisations. Finally, Section 7.5 – *Discussing RQ4: Mental Models of the SME Internationalisation* – compares the findings from the comparative study (Chapter 6) with those that have emerged from the literature review which compare mental models of the internationalisation.

7.2 Discussing RQ1: The CEO and the SME Internationalisation

The purpose of Chapter 4 was to answer Research Question 1: *What is the impact of the CEOs on the internationalisation processes of SMEs located within a developing country?*. Results from Chapter 4 suggest that some characteristics of the CEOs are significantly relevant in explaining the export intensity of SMEs located within a developing country, characteristics such as *education* and *tenure*. Findings from Chapter 4 suggest that the impact of CEOs affects two dimensions of the SME internationalisation process: the firm's performance and its international orientation.

Chapter 4 showed that when resources are not unique and limited, the CEO's decision-making process is one source of heterogeneous performance, a finding that is aligned with the dynamic managerial capabilities literature (Adner and Helfat, 2003). This is particularly the case for those decisions regarding the identification of the set of resources strategically relevant for superior international performance and their management during the process of internationalisation (Kunc and Morecroft, 2010). Although the two main assumptions of the RBV theory suggest that the resources are heterogeneously distributed among firms, and that they are imperfectly mobile (Barney, 1991), small firms which export low-manufacturing products (e.g., fruit, fish, lumber, or wine) exhibit an alternative case in which these two assumptions do not explain why firms perform better. SMEs with highly educated CEOs exhibit higher export intensity because these managers are able to develop unique capabilities to pursue new market opportunities (Teece et al., 1997). These dynamic capabilities underpinned by the CEO educational background and tenure provide the small firm with difficult-to-imitate combinations of organisational and functional skills to overcome the limitations emerged from exporting common and easy-to-imitate products.

In contrast, the CEO's tenure affected the export intensity of SMEs negatively. Results suggested that in Chile, long-tenure CEOs tend to sell mainly to the local market. When firms led by long-tenure CEOs are located at a distance from the customers, these CEOs perceive the internationalisation processes to be too risky because international markets may be associated with several problems to do with logistics, payments, and social conflicts (Westhead et al., 2001). In developing countries, long-tenure CEOs tend to sell mainly to the local market for three main reasons: it is attractive to sell in the local market (Leonidou et al., 2007); the SMEs is consolidated in the local market (Fan and Phan, 2007); and CEOs become more reluctant to take risks (Romano et al., 2001). However, the development of many trade agreements has motivated many entrepreneurs to create SMEs directly to satisfy the needs of foreign markets based on natural resource-based products, but only highly educated CEOs and entrepreneurs can make a difference in international markets.

On the other hand, the firm's international orientation is also explained by the CEO's educational background. The econometric analysis focused on a particular group of SMEs which are non-knowledge intensive (Weerawardena et al., 2007). The main characteristic of these small companies is to develop low-tech products which are exported in spite of their limited resources. Hence, when the product differentiation is not possible, the CEO's decision-making process plays a central role in the firm's internationalisation. Many of these firms after a short period of their inception focus on developing international activities (Knight and Cavusgil, 2004). The early internationalisation process of these new ventures is related to the notion of cultural distance in the international business literature – which generally translates into higher entry barriers or uncertainties for entering culturally distant societies relative to the home country of the focal firm (Fan and Phan, 2007). The value of educated CEOs lies in the resource configurations that they create and enhance, which enable the firm to pursue opportunities in foreign markets (Doving and Gooderham, 2008).

Additionally, educated CEOs with limited experience allow young firms to explore and identify opportunities in new markets (Autio et al., 2000). The greater flexibility of small organisational structures facilitates CEOs to establish formal (and informal) relationships with intermediaries and customers abroad. This flexibility of SMEs also represents an asset of youthfulness that stakeholders value and support (Shepherd, 2009).

In summary, findings from Chapter 4 suggest that the impact of CEOs affects the SME internationalisation process at the level of the firm's performance and its international orientation. Although findings highlight the role played by CEOs in the development of the SME internationalisation processes, a more accurate portrayal of the way in which CEOs of small organisations develop an internationalisation is necessary. This depiction of a strategy process can be used not only to describe this process, but to support the CEO's creative process in forming *mental leaps* between novel and familiar strategic initiatives via implicit reference to the abstract concepts that link them (Hodgkinson and Healey, 2011), such as causal links among strategic resources. Section 7.3 discusses these ideas with the findings that emerged from Chapter 5.

7.3 Discussing RQ2: The CEO's Resource Management

In Chapter 5, Research Question 2: *How do CEOs of small firms manage their resources for implementing an internationalisation strategy?* was tackled by showing the strategy development process of five CEOs related to the SME internationalisation. Representations of the internationalisation process as a resource system help to develop dynamic theories of how CEOs manage their resources for implementing an internationalisation strategy. Under a RBV perspective, Kunc and Morecroft (2010) suggest that the decision-making process consists of two steps: (1) resource conceptualisation and (2) resource de-

velopment. Resource conceptualisation involves the identification of a set of strategic and valuable resources, and the understanding of their causal factors (Kunc and Morecroft, 2009). Resource development involves those purposeful decisions of adjusting the level of the resources (Dierickx and Cool, 1989). SD modelling is suitable for describing the decision-making process under the RBV perspective because its stock-and-flow diagrams act as information filters that focus on representing the inflow and outflow of the resources system over time (Gary et al., 2008).

7.3.1 Resource Conceptualisation in the SME Internationalisation

Given the complexity of managing a system of interconnected resources and limited rationality, CEOs of small organisations develop mental representations of the resource system based on prior experience (i.e., learning lessons from enacting several times the same strategy process (King and Zeithaml, 2001; Senge and Sterman, 1992; Lippman and Rumelt, 1982)). CEOs' representations of the resource system were not a direct imprint of reality but a result of a complex identification, selection, and development of strategic resources shaped by their experiences (Senge, 2006; Nadkarni and Barr, 2008). Indeed, mental models developed by the five CEOs are highly affected by what they saw, understood, and perceived during the development of the strategy process. In each firm, the CEO experience determines the set of resources perceived to be strategically relevant through the attributions about the their future effects on the firm's performance (Morecroft, 1999).

The resource conceptualisation (Steps 1 and 2) was very important in creating strategic initiatives and in shaping subsequent resource development since CEOs discuss their assumptions of the potential resource configuration (SD model) to implement their internationalisation strategies. When CEOs make strategic decisions they only notice the information that is interesting or valuable to them and attach their meaning to the per-

ceived information (Gavetti et al., 2005). This information is then stored, based on the CEO's interpretation (Hambrick and Mason, 1984; Hambrick and Fukutomi, 1991) and it is recovered when some events trigger its use (Schwenk, 1988).

7.3.2 Resource Development in the SME Internationalisation

The discussion by Dierickx and Cool (1989) of the attributes of stock assets that make these assets difficult to imitate is an important analysis of why strategic assets have the potential for generating above – normal economic performance. CEOs investing in those resources perceived them as relevant for achieving superior firm performance. However, confounding effects, such as asset interconnectedness and time diseconomies (Dierickx and Cool, 1989), can generate dynamic complexity and make it exceedingly difficult for CEOs to establish a clear relationship between resources and firm performance (Kunc and Morecroft, 2010). When strategic problems are *ill-structured* and involve multiple perspectives, and incommensurable and/or conflicting interests (Mingers and Rosenhead, 2004), human cognition is not able to interpret such complex issues (Simon, 1955). Resource dynamics obtained from simulations show some implications of bounded rationality (Sterman, 1989a). Some of the scenarios that emerged from simulations were far from the real data. However, other scenarios were close to reality and were used to examine the firm's performance under several conditions suggested by CEOs. A good understanding of the resource system and its dynamics (resource accumulation and depletion) enables the firms to develop a better performance, as suggested by the LR and IW cases one year later. Zollo and Winter (2002) suggest that understanding the causal links between the resource development and the firm's performance is the core for developing dynamic capabilities. Therefore, the SD models developed by CEOs provide them with a base for a comprehensive behavioural theory of the dynamic capabilities of international small firms (Hodgkinson and

Healey, 2011). Learning about cognitive (model) and behavioural (simulation) aspects of the CEO's decision-making enriches the analysis of performance differences between similar firms (Kunc and Morecroft, 2010). This fact addresses one of the shortcomings in resource-based research (King, 2007) and international small business research (Cavusgil, 2009).

In summary, Chapter 5 suggests that the CEOs of small organisations manage a limited set of resources which is perceived by them as relevant to achieve either a superior firm performance (Kunc and Morecroft, 2010), or a business opportunity abroad (Autio et al., 2000, Haynie et al., 2009). Although the resource conceptualisation is affected by bounded rationality (Hambrick and Mason, 1984) and misperception of feedbacks (Sterman, 1989a), CEOs overcome these difficulties by developing dynamic capabilities underpinned by their business experience (Baron and Ensley, 2006) – a finding aligned to Chapter 4. Dynamic capabilities allow CEOs to invest (accumulate) and use the resources to implement and internationalisation strategy. With a smaller number of employees and less institutionalised structure, CEOs of international SMEs adapt their systems, routines, and collective employee mind-set to the imperatives of international competition (Cavusgil, 2009).

7.4 Discussing RQ3: Supporting the SME internationalisation strategy

In Chapter 5, Research Question 3: *How can SD modelling support the internationalisation strategy of small firms in practice?* was addressed by showing the facilitated modelling process related to SD modelling which supported the internationalisation strategy of five small firms. The use of SD modelling proved to be a good tool in achieving reflective engagement and analytical reasoning in individual strategic decision-making which is affected by insufficient, unclear, or conflicting information over time. In the OR/MS

literature, Warren (2004) suggests two main risks of applying SD modelling in improving the resolution of strategic problems in real organisations. First, ‘a large fraction of executives who could have gained real benefit from SD modelling may have come across only its qualitative representation’ (Warren, 2004:345). In the case study research, the qualitative representations of the five SD models (before the analysis of the formal equations and simulation) contained serious theoretical and pedagogical flaws. The CEOs were faced with a large array of data when making strategic decisions, data such as customers’ preference, prices, demands, new products, rivals, brokers, and new markets’ characteristics. Including neither the data about the internationalisation processes nor the nature of any relationships among variables (equations), these SD models could not be used to establish any policies for acting upon such data. Moreover, the first SD model developed prior to formulating equations contained errors in the links between variables and the misperception of feedbacks. This flaw was overcome by using of formal quantitative modelling and simulations. The set of mathematical relationships helped to formulate a desired range of policy rules used to develop potential scenarios about the future. In fact, simulations in the five cases showed robustness in the internationalisation strategy and provided the CEOs with opportunities for assessing strategic ideas and learning from simulated performance using real data. Secondly, Warren (2004:345) highlights that ‘executives who have had exposure to SD modelling have experienced disappointments that lead them to believe the approach does not offer attractive benefits in relation to the effort required’. In order to deal with this problem, the designed protocol allowed the creation of a preliminary problem boundary using less than approximately two hours in each firm. This protocol allowed the analysis of the convening discussions with the CEOs that explicitly link dynamic structure with system behaviour of their internationalisation process, and several strategic initiatives related to the internationalisation. From the facilitated modelling process, four

lessons emerged which can guide researchers and practitioners interested in supporting the internationalisation strategy of small firms using SD modelling will find useful: lessons from (1) modelling mental models, (2) learning from virtual performance, (3) assessing of strategic ideas, and (4) Shift of CEO's Mental Models.

7.4.1 Modelling Mental Models

Considerable effort has been made to understand the cognitive and learning processes of managers in SMEs (Shepherd and Zacharakis, 2003; Westhead et al., 2009). At the individual level, a number of works explicitly examine the role that cognitive processes, as well as elements associated with thinking and learning, play in understanding the opportunity recognition of entrepreneurs (Short et al., 2010; Baron and Ensley, 2006; Gregoire et al., 2011). Although these studies can be used to explain the cognitive mechanisms of CEOs in small organisations, the reduction of the decision-making process to a list of cognitive patterns limits the potential use of these results when developing models to support the strategy process. This research has shown that the structures and feedbacks underlying these patterns are expressed as a dynamic system of resources. This model allowed CEOs of small firms to test the feasibility of strategic initiatives before implementation. This approach to supporting the learning process is different in nature to traditional cognitive studies because simulations provide a dynamic analysis of the mental models related to strategy. For example, Baron and Ensley (2006) highlight a group of dimensions called *prototypes* which are cognitive frameworks that entrepreneurs acquire through experience. Entrepreneurs compare ideas for new products, services, means of production, or markets with their existing prototype for business opportunity. The study suggests that these prototypes are related to *how novel an idea is, the superiority of a product or service, and solving customer problems and the ability to generate positive cash flow*. In contrast, I have

shown that CEOs of small organisations constantly develop their own prototypes which are related to the strategic resources perceived as relevant to implementing an internationalisation strategy.

Contemporary research has shown that most of our mental models are very often systematically flawed (Senge, 2006). People do not understand feedback relationships, delay effects, and often do not notice all the information within their field of vision (Stermann, 1989a). Rather, people only notice the information that is interesting or valuable to them. Even though, these problems affect the description of mental models, when CEOs face an iterative process to refine their metal models, it is possible to reach a clear representation that shows the dynamism of the strategy process. The use of systems thinking helped CEOs to reflect and learn about their current internationalisation strategies.

7.4.2 Learning about Virtual Performance

SD modelling is a disciplined, scientific, and rigorous process that involves observing dynamic phenomena in the real world; testing assumptions; gathering data; and revising the model to improve understanding through simulations (Morecroft, 2007). Learning from virtual performance allowed CEOs to enhance their analysis of the ways of implementing a series of initiatives designed to improve performance. This strategic conversation using simulation opened the spectrum of possibilities for exploring, testing, revising and selection leading to the enacting of strategy (Dyson, 2004; Howick and Eden, 2011). In the absence of SD modelling (Steps 1 and 2), CEOs argued that they run their small businesses relying on business experience and formal education in the field, and many strategic decisions are based on judgments emerging from their mental models of the organisation and industry (trial-and error approach). That means strategies in small organisations tend to be emergent from contingency rather than from a planning process aligned to vision and mission

(deliberate strategy). The use of SD modelling to support a deliberate internationalisation strategy was a great challenge in this context where most strategies are emergent and depend on how the CEO *perceives* the business environment.

SD modelling enabled CEOs to test and refine strategic decisions through simulations. In each company, CEOs suggested one or two strategic decisions related to the internationalisation to be tested. CEOs learnt from virtual performance by compelling explanations about how performance differences among scenarios arise, persist, and disappear over time. In fact, CEOs found it very interesting explaining the potential heterogeneous performance among scenarios using the strength of the feedback processes (Gary et al., 2008). The use of this analysis helped CEOs to theorize the potential impact of scenarios that emerged from their mental models and real business decisions. It is through this learning that CEOs have changed their mental models about how the resources are perceived and employed to create new ways of improving the internationalisation process. The five CEOs were continually focused on the process of acquiring new knowledge, insights, associations, and routines that lead to incremental adjustments and innovations in products, processes, and actions (Knight and Liesch, 2002). This orientation increases the impact of simulations for supporting decision-making, and provides a mechanism by which CEOs of small organisations can identify and develop innovative market opportunities abroad.

A successful analysis of simulations for rehearsing strategy should contain three learning exercises: *motivational*, *emotional*, and *task-oriented* (Gaglio, 2004; Agarwal and Weill, 2012; Senge et al., 2007). *Motivational exercises* enable CEOs to imagine strategies and plans of actions that would lead to the achievement of strategic goals based on simulations. For example, CEOs developed a series of responses to the scenarios. They argued about what would be the potential impact to the organisation; what to do if this happens;

the strength and weakness of the current direction; and how the scenario would affect the strategic goals. Gaglio (2004) argues that this cognitive process occurs several times during real decision-making, such as when the CEOs mentally rehearse the sales pitch, handle objections before meeting with an international customer, and later when the CEOs recall the meeting in detail when they note what worked and what did not work. This experience shows how this mental rehearsal can be depicted using an analytical OR/MS tool. *Emotional exercises* have been despised for most of OR/MS approaches (Agarwal and Weill, 2012). Although I did not include any kind of formal emotional exercises, they emerged spontaneously from the conversations. Several emotional themes emerged from the analysis of the scenarios, such as the stimulus for running a wine company; problematic situations faced with international customers as a consequence of different mindsets; the frustration due to some failed negotiations; and family dilemmas (in family business firms). I recommend that they considered some of these issues in rehearsing scenarios because this strategy can be a powerful driver in understanding and change mental models (Senge et al., 2007). Finally, the *task-orientated exercise* is used to rehearse contingent scenarios that can cause a higher impact in the organisation. All scenarios which were evaluated and reported in this research focused on contingent issues. Realistic rehearsal can help CEOs understand causal patterns affecting real decisions.

7.4.3 Assessing Strategic Ideas

The analysis of the dynamics of the strategic resources provided a basis for assessing the most appropriate strategic ideas perceived by CEOs to improve the internationalisation strategy. This learning process helped CEOs to reflect on the current internationalisation process and compare their actual performance with desired performance. Although it is difficult to accurately compare the outcome of different simulated resource investments

given the complexity of the relationships affecting them, without any analytical framework the evaluation of strategic ideas of small organisations become a trial-and-error game. The Strategic Development Process (SDP) view encourages researchers to develop analytical methods enabling them to choose the most appropriate initiative to be implemented (Dyson et al., 2007). The facilitated modelling process reported that the use of SD allowed CEOs to suggest 12 initiatives related to the internationalisation (Chapter 5). These initiatives were not intentionally created but they emerged from the conversation. This finding highlights a new potential use of SD within the SDP, because SD modelling is not considered as a method for creating strategic initiatives (Dyson, 2007).

In SMEs, many strategic initiatives are created from a top-down approach (Romano et al., 2001). Thus by using SD modelling, CEOs can rehearse innovative strategic initiatives or replicate them from successful experiences in similar companies. For example, in the wine industry, Juan (LR) could analyse the impact of creating a new premium wine line following the initiatives suggested by Irene (I-wine). Using this rehearsal, the same initiative (e.g., to explore wine competitions) can have different virtual performances due to differences in CEO's mental models of the internationalisation.

7.4.4 Shift of CEO's Mental Models

The five CEOs had strong event-orientated thinking before the modelling was begun. Mental models at earlier stages of internationalisation can be affected by the proliferation of potentially poor and damaging analysis as a consequence of inexperienced practitioners (Winch and Arthur, 2002). This lack of experience leads CEOs to use the same lens to evaluate the domestic and foreign environments (Nadkarni and Perez, 2007). These issues increase the complexity perceived by CEOs about the internationalisation process (Gavetti et al., 2005). The ability to update decision makers' mental representations in response

to changes in external environments is a critical managerial capability (Hodgkinson and Healey, 2011). In this research, I have shown how CEOs of small organisations gained benefits from the process of modelling internationalisation strategies prior to implementation.

The modelling and simulation of real resource-based strategies were the mechanisms for attempting to change mental models. The effectiveness of these changes depended on two assessments: (1) the change of mental models and (2) the change of behaviour. Analysing simple changes from the description developed before modelling (Steps 1 and 2) and after the SD modelling (Steps 3 and 4), the CEOs were able to identify more strategic resources, causal links, and strategic initiatives involved in the internationalisation. On the other hand, the analysis of behaviour was based on contrasting reality (what is or what was) with a mental image of what might have been or what could be (Gaglio, 2004). Findings provided in Chapter 5 suggest that the CEOs mentally changed his or her responses by imagining what should have been acted. Moreover, the analysis of what happened one year later in these organisations provides strong evidence that the use of simulations that have emerged from CEO's models of the internationalisation play an important role in developing alternative scenarios which can be used to reflect on the potential strategic actions that can be taken in the future.

Few studies in the SD literature have shown the efficacy of SD interventions in enhancing mental models of the decision-makers and their impact on the firm's performance (Morecroft et al., 1991; Senge and Sterman, 1992; Cavaleri and Sterman, 1997; Repenning and Sterman, 2002; Senge et al., 2007). Evaluation helps identify the tools and techniques that can be used successfully, the situations in which they work, and their limitations (Cavaleri and Sterman, 1997). Table 7.1 compares the results from Chapter 5 with other SD interventions. All SD interventions have been developed in developed countries with

knowledge intensive firms (Von Nordenflycht, 2010). This doctoral thesis has explored the mental models related to an internationalisation strategy in firms located in Chile. In these firms, there is little evidence that CEOs use knowledge intensively as the basis of their competitive advantage because their products and production functions do not rely on a substantial body of complex knowledge (Filatotchev et al., 2009). Therefore, this doctoral thesis extends the findings that have been found in the literature of SD modelling by providing evidence that a shift in mental models can be also triggered in SMEs whose products and resources are not particularly unique (Knight and Cavusgil, 2004).

In summary, Chapter 5 suggests that SD modelling is suitable to support the internationalisation strategy of small organisations because it allows CEOs to improve their mental models of internationalisation (e.g., a better recognition of resources, their interrelated relationships, and delay effects). Additionally, SD modelling enabled CEOs to test and refine strategic initiatives through simulations. Reflections from simulations helped some firms to improve performance by analysing some initiatives prior to implementation – a valuable finding to support SD interventions in small organisations.

Table 7.1: Comparison of results from Chapter 5 with other SD interventions

Element	Characteristic	This Study	Morecroft et al. (1991)	Senge and Sterman (1992)	Cavaleri and Sterman (1997)	Repenning and Sterman (2002)	Senge et al. (2007)
Country		Chile	United Kingdom	United States	United States	United States	United States
Industry		Wine, fruit, and fish	Biotechnology	Insurance	Insurance	Electronic manufacturing	Oil, motorcycle, technology, and clothing
Firm		5 SMEs	1 SME	1 SME	1 Firm (Not reported size)	1 Large firm	5 Large firms
SD approach		SD modelling process	SD modelling process	Use of SD simulators	Use of SD simulators	Use of SD simulators	SD modelling process
Role of adviser		Facilitator	Expert	Facilitator	Expert	Expert	Facilitator
Outcomes (after intervention)	Improvements in mental models	All participants (5) developed more complex mental models	Participants suggested that they learnt about the business process	Participants could not articulate a significant new insight, but they clarified assumptions and shared experiences	Participants suggested that they experienced a shift in their mental models	Participants enhanced their understanding of linkages between errors and performance	Participants recognised the need for collaboration across multinational companies

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Table 7.1 – Continued

Reflection on strategic actions	100% participants suggested new strategic actions, but 40% of them followed strategic actions	Insights from SD model led to increased priority for two internal projects	Participants compared the simulated results to their expectations but simulations emerged from the simulator rather than from their firm's strategy	Not performed	Participants described a trade-off between doing their real work and the improvement work required by the initiative	Three reflections were discussed: Conceptual, relational, and task-oriented work
Business Performance	40% of cases increased the business performance	Not reported	Not reported	Intervention did not produce measurable improvements in business performance	Not reported	Not reported
Model elicitation	Model developed by participants-adviser	Model developed by advisers	Model developed by participants-advisers	Not performed	Not performed	Not reported
Validation issues	Quantitative and qualitative procedures	Not reported	Not reported	Not reported	Not reported	Not reported
Data sources	Workshops, interviews, and archival data	Workshops and Interviews	Workshops and interviews	Interviews, archival data, and questionnaire	Interviews	Workshops
Evaluation Period	One year after interventions	Last meeting	Not reported	6 years after intervention	Not reported	Not reported

7.5 Discussing RQ4: Mental Models of the SME Internationalisation

The purpose of Chapter 6 was to answer Research Question 4: *Are the CEO's mental models of the same internationalisation strategy similar in those firms with similar resources?* by developing a comparative study of the mental models related to the SME internationalisation. Results suggest that CEOs in similar small organisations (e.g. similar products developed by common and limited organisational resources) have different mental models of the best internationalisation strategy to pursue, which is an interpretive view of the strategy formation (Kunc and Morecroft, 2009). Chapter 2 discussed that one of the most relevant theories explaining the development of internationalisation processes is the RBV. RBV theory assumes that a firm has competitive advantage if it implements a value-creating strategy which is not simultaneously implemented by current or potential rivals (Grant, 1991). The main argument of this theory is that even if the degree of heterogeneity of firms' strategic resources in the same industry is an empirical question, some amount of heterogeneity should certainly exist within different firms in order to be able to explain the observed performance differences between them (Barney, 1986). Otherwise, firms possessing identical resources would conceive of and implement the same strategies and could only improve their effectiveness and efficiency to the same extent, ending up with no sustained competitive advantage or performance superiority (Barney, 1991). However, Chapter 6 showed that the same strategic resource leads to the implementation of an internationalisation strategy differently in similar companies because the CEOs conceptualised differently the causal links which are used to acquire or create this resource (resource development). That means that the resource accumulation involves more than just analysing the conditions under which the strategic resources generate above normal economic returns

(Barney, 1986) or the cost of development resources (Dierickx and Cool, 1989), but it involves how decision-makers understand the resource system available in their companies in making strategic decisions (Kunc and Morecroft, 2010).

Analyses of decision-making processes by using mental models have been performed for many years (Senge, 2006). However, only two studies which compare mental models of the internationalisation process have been found in the literature review (See Chapter 2). Nadkarni and Perez (2007) empirically investigate why some firms engage in low international commitments in the early phases of internationalisation. In contrast, Gaglio (2004) develops a theoretical analysis about how entrepreneurs think and reason when they identify an opportunity. Table 7.2 shows a comparison of results from Chapter 6 with both studies developed by Nadkarni and Perez (2007), and Gaglio (2004).

In summary, Chapter 6 confirms that CEOs have different mental models of the best internationalisation strategy but such differences are triggered by the technical and managerial experiences of CEOs which are not directly related to the firm's idiosyncratic resources. The experience acquired by CEOs affects their understanding of the causal links involved in the development of resources over time (Kunc and Morecroft, 2010). Past experiences at other firms about specific strategy issues also contribute to defining current mental models (McDonald, Westphal and Graebner, 2008). The analysis of how mental models change over time can open up new lines of research to clarify and improve the mechanisms which foster the internationalisation of small organisations.

Table 7.2: Comparison of results from Chapter 6 with other studies related to mental models of internationalisation

Elements	This Study	Nadkarni and Perez (2007)	Gaglio (2004)
Sample	Five firms (one mental model in each organisation)	Not specified (initial sample 212 firms)	no sample
Use of models to structure mental models	Models captured variables, loops, feed-back and delay effects related to the internationalisation	Models captured variables and links related to the internationalisation (mindset)	not performed
Approach	SD modelling	Causal mapping	Theoretical analysis
Comparison between mental models of the internationalisation	performed	performed	performed
Method to compare mental models	MDR	regression modelling	Theoretical analysis

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Table 7.2 – Continued

Finding from mental models	Mental models are different when CEOs have different business and technical experiences	Mental models are different at an early internationalisation	Mental models are different when decision-makers have different orientation to opportunity recognition and counterfactual thinking
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7.6 Summary of the Key Points of Chapter 7

Chapter 7 discusses how the answers to Research Questions 1, 2, 3, and 4 contribute to different domains of IB, OR/MS, and strategy studies. Section 7.2 demonstrates that the impact of CEOs affects two dimensions of the SME internationalisation process: the firm's performance and its international orientation. (Research Question 1). When resources are not unique and limited, the CEO's decision-making process is one source of heterogeneous performance, a finding that is aligned with the dynamic managerial capabilities literature (Adner and Helfat, 2003). The value of educated CEOs lies in the resource configurations that they create and enhance, which enable the firm to pursue opportunities in international markets (Doving and Gooderham, 2008). Section 7.3 provides a better understanding of how CEOs develop their internationalisation processes under a RBV perspective (Research Question 2). The discussion focussed on how the CEOs link strategic resources and their source of competitive advantage (Kunc and Morecroft, 2010). In small organisations, CEOs are highly affected by what they see, understand, and perceive during the development of the strategy process. The CEO's experience determines the set of resources that are perceived to be strategically relevant by analysing the expected effects of these resources on the firm's performance (Morecroft, 1999). Section 7.4 provides evidence that the internationalisation of small organisations is a dynamic, complex, and time-sensitive process which can be supported using SD modelling (Research Question 3). Supporting the internationalisation strategy of SMEs through strategy rehearsal was an effective way to trigger the CEO's mental model changes. To show this change in mental models is one of the main findings extracted from the doctoral thesis. Finally, Section 7.5 confirms that CEOs have different mental models of the best internationalisation strategy to pursue (Research Question 4). However, such differences are triggered by technical and managerial experiences of CEOs which are not directly related to the firm's idiosyncratic

resources – a controversial finding for the RBV theory (Barney, 1991) but supported by several scholars from the dynamic capability perspective (Hodgkinson and Healey, 2011; Kunc and Morecroft, 2010; Teece, 2007; Adner and Helfat, 2003).

Chapter 8

Conclusions

8.1 Summarising Chapters

In the last decade, one of the main shifts in the strategy field was to move beyond the analyses of the organisation's external environment (Porter, 1980) to those which consider the firm's internal resources and capabilities (Eisenhardt and Martin, 2000). In this view, scholars have paid increasing attention to the cognitive and behavioral processes underpinning the capabilities that promote organisational learning and performance (e.g., Teece et al., 1997; Adner and Helfat, 2003; Alvarez and Busenitz, 2001; Gavetti et al., 2005; Kunc and Morecroft, 2010; and Hodgkinson and Healey, 2011). Nonetheless, there is still considerable ambiguity with regards to how CEOs of small organisations learn from the process of formulating and implementing an internationalisation strategy, especially within developing countries (Knockaert et al., 2011). The doctoral research examines the role of the CEO in the development of an internationalisation strategy from small companies by showing that (1) the CEO's formal education affects positively the export intensity of small firms, and (2) the analytical reasoning supported by SD models helps CEOs in developing an internationalisation strategy. The doctoral thesis was divided into eight chapters:

Chapter 1 *Introduction* presents a brief description of the doctoral thesis which included: the research questions emerged from Chapter 2 literature review; the research design explored in Chapter 3 Methodology; and the approaches taken in conducting the analyses performed in Chapters 4, 5 and 6. Finally, the Roadmap (Figure 1.1) outlines the structure of the doctoral thesis.

Chapter 2 *Literature Review* discusses that there are different approaches available to support organisational learning in order to improve the firm's performance. The stream developed by Dyson et al. (2007) – the Strategic Development Process – suggests that the use of OR/MS tools can enhance the analysis of strategic decision-making. In this literature, SD modelling is one of the prominent tools for supporting strategy (Morecroft, 2007; Kunc and Morecroft, 2007; Sterman et al., 2007; Gary, 2005; Langley and Morecroft, 2004; Dangerfield and Roberts, 2000). Chapter 2 provides evidence and suggestions about how SD modelling can be used to support the internationalisation strategy of small organisations. Also, it suggests how the internationalisation process of SMEs can be analysed within the strategic development process.

Chapter 3 *Methodology* details the research design, data collection and data analysis procedures of the doctoral research. Section 3.2 describes database, method and constructs of analysis which were used to carry out the survey analysis which was presented in Chapter 4. Section 3.3 shows how the case studies, the analytical tool for supporting strategy, and the protocol of interviews were selected to develop the case study research (Chapter 5). A detailed description of the profile of the respondents (CEOs) and their industries were extended in Chapter 3.

The study presented in Chapter 4 *Influences of CEOs during the Internationalisation of SMEs* tackles the research question 1 (What is the impact of the CEOs' characteristics

on the internationalisation processes of SMEs located within a developing country?) by examining the influence of CEO's characteristics on the export intensity of small and medium-sized enterprises in Chile. The first section develops four hypotheses which were related to the impact of CEOs on the firm's export processes (e.g., tenure, education, background, and age). These hypotheses were tested by using data from 921 SMEs located in Chile which was provided by the Chilean National Institute of Statistics. Results from this study revealed that the CEOs' education is particularly relevant for explaining the export intensity. CEOs who developed capabilities from formal training, in companies that do not seem endowed with particular idiosyncratic resources, export intensively. This result provides evidence of the role of the CEO's learning (Adner and Helfat, 2003) in shaping competitive advantage in internationalisation processes of SMEs in developing countries. Results from Chapter 4 have three main implications for the OR/MS practice in the strategy arena. First, analytical reasoning supported by OR/MS tools can be used to help CEOs in strategic decisions related to internationalisation. Second, OR/MS tools can be used to support individual decisions made by CEOs. Third, OR/MS tools can change and improve CEOs' mental models related to the internationalisation of small organisations.

Chapter 5 *Supporting Strategy of Small Organisations* describes the case study research which was carried out in five small organisations in Chile. Chapter 5 addresses both research question 2 (*How do CEOs of small firms manage their resources for implementing an internationalisation strategy?*), and research question 3 (*How can SD modelling support the internationalisation strategy of small firms in practice?*) by presenting five individual case study reports (LR, IW, CT, AF, and FT). Individual reports detail how the internationalisation strategy of these five small organisations was supported. Each report was divided into four steps which were described in the protocol section of Chapter 3: (1) re-

source conceptualisation, (2) boundaries of the resource system, (3) resource development, and (4) rehearsal. These four steps allowed CEOs to structure, simulate and evaluate potential consequences of their internationalisation strategy. Findings emerging from this process provide evidence that SD modelling motivated the CEOs to discuss the current strategy and its likely outcomes. This dialogue provided opportunities for both assessing strategic ideas and learning from simulated performance.

Chapter 6 *Mental Models of Internationalisation* shows and discusses how the CEO's mental models led to the development of the internationalisation strategy of the five case studies. These mental models were depicted by CEOs during the interviews. Causal structures embedded in the CEO's mental models were compared across companies. From the comparative analysis interesting aspects emerged that can be contrasted with the literature of small business studies. For example, the CEOs' representations of the resource system available to develop an internationalisation strategy were not a direct imprint of reality, but a result of a complex identification, selection, and development of strategic resources shaped by their experiences. The CEOs' perception of the causal links concerning the resource system led them to develop the same internationalisation strategy (direct exports) differently, despite these firms having similar resources (e.g., *customer portfolio*, *CEO's experience*, *production (products)*, *networking*, and *communication technology*). In these case studies, the CEOs had different mental models of the best internationalisation strategy to pursue, which is an interpretive view of the strategy formation (Kunc and Morecroft, 2009). Moreover, CEOs with postgraduate qualifications (LR and IW) reported a positive outcome on the firm's performance one year later, a finding which is aligned to the accepted hypothesis 2 of Chapter 4 (the CEO's education is positively related to the export intensity of SMEs).

Finally, Chapter 7 *Discussion* discusses the findings described in Chapters 4, 5, and 6. From this discussion emerged several lessons to theory and practice of OR/MS and IB studies: (1) lessons from modelling mental models, (2) lessons from learning about virtual performance, (3) lessons from assessing strategic ideas in small companies, and (4) Shift of CEO's Mental Models. Chapter 7 provides evidence that the internationalisation of small organisations is a dynamic, complex, and time-sensitive process which can be supported using modelling and simulation. Supporting the internationalisation strategy of SMEs through strategy rehearsal was an effective way to trigger the CEO's mental model changes. To show this change in mental models is one of the main findings extracted from the doctoral thesis.

8.2 Contributions

Research in the strategy field has characterised the impact of CEO's decision making on the firm's performance into two broad classes: luck and differences in decision making (Gary et al., 2008). If the performance differences were caused simply by lucky decisions, it is not possible to analyse and explain why firms perform differently, and CEOs of small companies do not make any value-added contribution to business performance. Therefore, their knowledge and experience would be only an antecedent rather than a strategic resource. On the other hand, if someone assumes that managerial decision making is a source of performance heterogeneity, CEOs' decisions play a central role in explaining firm performance. Dierickx and Cool (1989) argue that the manager's sequence of strategic decisions cause the evolution of resources and competitive positions to differ among firms over time. However, this evidence is not conclusive when CEOs manage small firms which are located within markets with underdeveloped production of high-technology products and low technical knowledge required for production. The first contribution of this thesis

is to demonstrate that the formal education of CEOs causes heterogeneous performance among international SMEs located within a developing country. The CEO's education gives small firms a competitive advantage over their competitors in target markets. Hence, small firms with educated CEOs can improve their organisational capabilities by using analytical reasoning supported by OR/MS models (O'Brien and Dyson, 2007).

The second contribution falls in the area of OR/MS studies. Chapter 5 details how SD modelling can support a deliberate strategy of internationalisation by improving CEO's mental models of the resource system available in their organisations. Little documentation of applying reflective engagement and analytical reasoning to support the internationalisation process of small firms has been found in the OR/MS literature (Ahlström et al., 2007). Chapter 5 provided evidence that simulations of the CEO's mental models can help them to react more effectively to unexpected changes of the external environment. This second contribution suggests a potential area for OR/MS research focused on supporting individual decision-making (Dyson et al., 2007; Morecroft, 2007).

On the other hand, Chapter 5 shows how CEOs of small firms implement internationalisation strategies using their organisational resources, a contribution to the International Business (IB) area. Little evidence about how the perception of the resource system leads CEOs to develop an internationalisation process has been found in the literature (Nadkarni and Perez, 2007; Nadkarni and Barr, 2008). To address this gap, Chapter 5 describes the representation of the resource system (mental models) of five CEOs who participated in the case study research. These mental models reflected how CEOs conceptualise and manage the resources they need to implement an internationalisation strategy. From the analysis of mental models it was found that CEOs can view their firms as a system of resources and capabilities. The systemic representation (stock-and-flow diagrams) provided CEOs

with a tool to discuss the relationship between resources and customers' demand.

Finally, the fourth contribution of this thesis falls in the area of management studies. There is little evidence about how the CEOs' perception of inter-relatedness among organisational resources can explain potential difference in performance across similar SMEs. The doctoral thesis addresses this gap by providing evidence that the structure of CEO's mental models about the firm's resource system causes heterogeneous performance in small firms which have limited resources, export low-technology products, and are located within the same geographic area. This finding supports and extends the behavioral foundations of strategies developed by small organisations (Kunc and Morecroft, 2010; Hodgkinson and Healey, 2011).

8.3 Limitations and Future Research Directions

The doctoral thesis presents some limitations which can be overcome in future research. First, the survey study (Chapter 4) has tested the hypotheses in one country with particular conditions; therefore, future research should consider small firms across several countries. According to Crossland and Hambrick (2011) country-level managerial characteristics mediate the relationship between institutions and managers effects on firm performance. Hence, comparative studies of managerial characteristics across countries with different power distance (Tosi and Greckhamer, 2004) would be useful to determine conclusively the impact of the CEO's education on the small firm's performance.

Second, although the survey analysis has identified two relevant characteristics of CEOs which help them to develop a successful internationalisation process (e.g., tenure and education), there are likely additional dimensions to be considered. Future research should investigate the characteristics and behaviours of entrepreneurs that decide to start up a

born-global firm (Knight and Cavusgil, 2004). For example, how do entrepreneurs structure an internationalisation strategy from the time they decide to have a company selling only abroad? Another future study would be to compare differences between CEOs who are owners of their firms, and CEOs who are not one of the shareholders. Owners often use firm formation to exploit opportunities by using their own financial and human resources (Alvarez and Parker, 2009). Hence, a comparative study which considers both type of CEOs may be useful to understand the CEO's physical and mental persistence to venture growth (Gielnik et al., 2012).

Third, the case study reports presented in Chapter 5 outline the ways in which cognitive structures drive the internationalisation process of small firms. However, five case studies are a small sample which is not truly representative of the whole population of SMEs in Chile. Future research should explore in a larger group of SMEs within different industries and countries. Although the findings offered in Chapter 5 provide a better understanding of how CEOs may think and reason during the internationalisation process, future research may explore how an opportunity is perceived abroad by CEOs who have different educational background, experience and ideologies. The cognitive process which leads CEOs to implement internationalisation strategies in small organisations represents a challenging research agenda for behavioural research into international entrepreneurship. Elements such as metacognition, emotion management, and self-regulation can be the cornerstones of the analysis of dynamic managerial capabilities developed by international entrepreneurs (Hodgkinson and Healey, 2011). Learning affected by previous mentioned elements can help CEOs to improve their mental models during early stages of the internationalisation.

Fourth, modelling and simulation are two tools that helped CEOs to explore their mental models about the internationalisation process. Nonetheless, despite the findings provided

in Chapters 5 and 6 suggested that the CEOs mentally changed his or her perception on possible courses of actions, its implications on the firm's performance were unclear. Two companies (LR and IW) showed a positive outcome on the firm's performance one year later. Two firms (CT and FT) showed a negative performance one year later (highly related to the deficit in resources). One firm (AF) had unexpected result on the firm's performance (the CEO resigned and started up a new firm). Future research should consider a larger sample of small businesses in order to determine the effectiveness of the SD modelling on the firm's performance. Also, future studies should analyse how the analysis of SD models affects the speed of the CEO's strategic response to environmental events. Speed of response is influenced by beliefs regarding the causal logic which links firm strategy (actions) and environment (Nadkarni and Barr, 2008). Hence, complex mental models – represented as SD models – may be associated with faster responses to environmental changes giving SMEs a competitive advantage over their rivals. The protocol provided in Chapter 3 can be used as an instrument to elicit such SD models.

Fifth, despite the benefits suggested from the findings in Chapter 5 and 6, some difficulties of using modelling and simulations to support CEOs in strategic issues were faced. Firstly, the use of qualitative and intuitive concepts was useful to present the preliminary mental models of the internationalisation, but unstructured concepts made the development of analytical relationships difficult. The use of clear and quantitative concepts at the moment of developing SD models (stock-and-flow diagrams) allow the development of clear equations. The use of soft approaches can help to support the conceptualisation phase in SD modelling but if the idea is to run scenarios (learning from virtual performance), the use of qualitative variables is not adequate to convert the description of CEO's mental models to level and rate equations (Forrester, 1994). Secondly, the CEOs' representation of the resource system was not a direct imprint of reality. Becoming embedded in the

internationalisation process allows the building of constructive conversations with CEOs during the modelling phase.

Sixth, SD modelling allows CEOs to *identify* new opportunities and to *rehearse* them in order to understand their potential outcomes on the firm's performance. The analysis of the opportunity identification process can offer SD researchers an approach to explore the assertions made by the theory of international entrepreneurship (Cavusgil, 2009). The area of opportunity recognition can move beyond the descriptive analysis of the entrepreneurial characteristics and begin to consider questions about dynamics and contingencies (Gaglio, 2004). SD modelling is easy to teach and to adapt to any business situation (Kunc, 2012). Hence, teachers, practitioners, and trainers may use SD modelling to show students and practitioners the assertions made by international entrepreneurs by simulating scenarios which seem conflictive or unfeasible during the internationalisation. This analysis opens up a fertile terrain for scenario planning research.

Seventh, the comparative study presented in Chapter 6 offers a cognitive view of decisions-making to debate internationalisation strategies and their potential outcomes for firm's performance. However, this chapter compared the structure of the CEO's mental model rather than the dynamism that emerged from simulations. In system dynamics, structure determines behaviour, hence it would be useful to compare the behaviour of two similar models (Forrester, 1961). There are not methods available to develop this kind of comparative studies because decision-makers mentally deduce the system structure which is subjected to severe bias (Booth-Sweeney and Sterman, 2007). Nonetheless, future research may develop methods to compare both structure and behaviour of SD models by analysing how the interaction of factors perceived as relevant by decision-makers fit to historical data (Morecroft, 2007). Another possibility would be to account for the dominance of struc-

tures, such as feedback loop and delay effects (Groesser and Schaffernicht, 2012) over a period of time. In small organisations, this period may vary according to industrial and market dynamism (Grant, 2008).

The emerging number of articles published in the area of managerial cognition represents a wide and deep research stream for future research in strategy, international businesses, and entrepreneurship areas (Gaglio, 2004). I hope that this doctoral thesis prompts a fruitful line of research and debate that extends and supplements theories of managerial cognition, dynamism in mental models, dynamic capabilities in small organisations and international business in general.

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Appendix A

Case Study Introduction Letter

Business Name

Business Address Line 1

Business Address Line 2

Date

Dear [Business Owner/CEO Name]:

I am a doctoral researcher, specializing in Operational Research and Management Science at the Warwick Business School (United Kingdom). I would like to interview you about your [wine/food/fish business] as part of a project called '*Supporting the internationalisation strategy of small organisations*'. The purpose of this study is to examine how the Chief Executive Officer (CEO) develop the internationalisation process. This analysis is focused on enhancing the competitiveness of SMEs located within developing countries.

Specifically, I would like to interview you about your business to get a detailed look at your internationalisation process. There has been a substantial amount of research conducted on the active role played by CEOs of small and medium sized enterprises (SME) in internationalising during the recent years. Majority of the CEOs use knowledge about

the international markets as their primary basis for competitive advantage. However, there exists a lack of research regarding how the CEOs of small firms located within developing countries implement their internationalisation strategies. This project will focus on reducing this gap by providing empirical evidences about the influences of CEOs on their internationalisation strategies.

This research consists in three interviews that should take about 2 hours each one. I will call you in approximately three days to follow-up on this letter and, if you are willing to participate in our study, set up a time when we can meet for the interview.

Thanks very much for your time,

Sincerely,

Juan Pablo Torres

Contact Information:

Juan Pablo Torres

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Appendix B

Informed Consent Form

Business Name

Business Address Line 1

Business Address Line 2

Date

Dear [Business Owner/CEO Name]:

This interview is part of a project called ‘*Supporting the internationalisation strategy of small organisations*’. Thanks for agreeing to participate in this case study of the internationalisation process. The purpose of the round of interviews is to get a detailed look at the internationalisation process as well as to enhance the competitiveness of your company. Specifically, I want to interview the Chief Executive Officer (CEO) to obtain information of the development of resources over time.

This research involves three interviews that should take about 2 hours each one. Your participation in the study is completely voluntary. However, you are in no way obligated to participate in it. You will not be penalized in any way if you decline to participate in it. You may ask questions about the study both before committing to participate in it and

at any time throughout the study. If you do choose to participate in the study, I would like to tape record our interview with you so I have something to refer to, to check facts. You may refuse to have the interview taped and still participate in the study. If you grant us permission to use the tape recorder, you may request that the tape recorder be turned off at any time. I will destroy the tapes no later than three years after the interview. Also I will destroy the interview guide notes and data no later than three years after the interview. You may also refuse to answer any question at any time and you may choose to end the interview or withdraw from the study at any time.

The information I will be asking you to share WILL be published in a research report. However, in no way will your name or other identifying factors be linked to individual economic data for publication purposes. Instead, this information about the internationalisation process will be used to illustrate general estimates on levels of investment, income, and profitability. If there is something you prefer not to have publicly disclosed, please be sure to let me know. You will also be given a signed and dated copy of this consent form. You may contact me at the Business Administration Department of the Universidad de Chile, with any questions, concerns or complaints. I can be contacted via: email at jpablo.torres@uchile.cl, phone (+56 telephone number) and website (<http://www.fen.uchile.cl>).

INFORMED CONSENT

I have read/heard and understand the above conditions for this interview. I understand that the information, including financial data about the organisation, will be published in research reports exploring the impact of SME's internationalisation from developing countries. I acknowledge that I have been informed that I will have the opportunity to review and approve any written materials before they are published. I hereby agree to

participate in this interview*.

Signed — — — — — **Date:** — — — — —

(Interviewee)

I addition to agreeing to participate in this interview, I hereby give ... /do not give ... my permission for the case study research of supporting the internationalisation to record this interview.

I also hereby give ... /do not give ... my permission for the case study research of supporting the internationalisation to include information about my organisation in reports, and use the name of our organisation in forthcoming publications.

Signed — — — — — **Date:** — — — — —

(Interviewee)

Signed — — — — — **Date:** — — — — —

(Project Leader)

Contact Information:

Juan Pablo Torres

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*This consent form will be kept by the researcher for at least three years beyond the end of the study

Appendix C

VENSIM coding

LR model

New Customers=Wine Customers*(International Marketing Activities+Wine Quality+E Business+Brokers+Country Brand)

new contracted employees= Enrolment Decisions*N

Enrolment Decisions= N

Training Programmes= TMT Experience*N

Wine Quality= Training Programmes*N

New acquisitions and developments=New Projects*E Business new experiences=(TMT size*N)+(International Marketing Activities*N)+(Wine Production*N)

Chile's Trade Agreements= N

Country Brand= Chile's Trade Agreements*N

Brokers= N

Competitors' response = WITH LOOKUP (Wine Customers/Max number of loyal customers,[(A, B)...])

Continued on Next Page...

Table C.1 – Continued

E Business = WITH LOOKUP (Systems for E business, $[(A, B) \dots]$)
Systems for E business = New acquisitions and developments $*N$
Exports= Wine Customers $*N$
Harvest Activities= DELAY FIXED(Wine Customers $*N$, A,B)
International Marketing Activities = WITH LOOKUP $((0.1*\text{TMT Experience})+(0.1*\text{TMT's languages}),[(A, B) \dots])$
Lost Customers= Wine Customers*Competitors' response
Max number of loyal customers = N
New international languages=TMT size $*N$
New Projects= N
TMT Experience = new experiences $*N$
TMT size = new contracted employees $*N$
TMT's languages= New international languages $*N$
Wine Customers= New Customers-Lost Customers
Wine in Production= Harvest Activities-Wine sales
Wine sales= Wine Customers $*N$

IW model

Awards= Wine Quality $*N$
New Retailers = (Taste exhibitions*Rate of retailers per taste exhibitions)+(E Business*Rate of retailers per E-business)
International Markets = Premium Wine Customers $*N$
Limits in production= N

Continued on Next Page...

Table C.2 – Continued

Desired Systems = Contacts with sophisticated customers *N
Rate of customer per taste exhibition= N
Exports = Wine sales *N
Rate of retailers per E-business= N
Increments of Wine Price = WITH LOOKUP (Awards,([(A, B) ...)
Rate of retailers per taste exhibitions= N
New Customers=(Specialist wine retailers*Rate of customers per retailers)+(Taste exhibitions*Rate of customer per taste exhibition)+(Increments of Wine Price*Premium Wine Customers)
Wine sales= IF THEN ELSE(Premium Wine Customers*N - Wine Production> 0 , Wine in Production , Wine in Production -(Premium Wine Customers *N))
Rate of customers per retailers = N
Time to adjust systems= N
New Acquisitions= (Desired Systems-Communication Systems)/Time to adjust systems
Wine Quality = WITH LOOKUP (Owner Experience,([(A, B) ...)
new managerial activities= Specialist wine retailers *N
Customers preference = WITH LOOKUP (Premium Wine Customers/(Limits in production+Problems with deliveries),([(A, B) ...)
Problems with deliveries= N
Communication Systems= New Acquisitions *N
Harvest activities = DELAY FIXED(Premium Wine Customers*(Wine Quality *N), A,B)

Continued on Next Page...

Table C.2 – Continued

Lost Customers = Premium Wine Customers*Customers preference

Taste exhibitions = Contacts with sophisticated customers+E Business*N

Specialist wine retailers= New Retailers*N

E Business = WITH LOOKUP (Communication Systems,([(A, B) ...])

Contacts with sophisticated customers = WITH LOOKUP ((N*Owner Experience),([(A, B) ...])

Owner Experience= new managerial activities*N

Premium Wine Customers= New Customers-Lost Customers

Wine in Production= Harvest activities-Wine sales

CT model

Land capacity= N

Collection from Agriculturist= External agriculturists*N

Desired Agriculturist=(Plum Demand-Dried Plum Production)/ N

New Agriculturists = (Desired Agriculturist-External agriculturists)/Time to negotiate with agriculturist

Exports = (Collection from Agriculturist+Dried Plum in Production)* N

Payment Risk = N

Firm harvest capacity=(Land capacity*Land)+Experience producing dried plums*N

Fruit Quality = Experience producing dried plums*N

Land= N

Continued on Next Page...

Table C.3 – Continued

Plum sales= IF THEN ELSE(Plum Demand-Dried Plum in Production> 0, Dried Plum in Production, Plum Demand)

Plum harvest and collection= Firm harvest capacity+Collection from Agriculturist

Time to negotiate with agriculturist= N

Capacity for managing agreements = WITH LOOKUP (External agriculturists/Financial resource for collecting plums,([(A, B) ...])

Lost Agriculturists= Capacity for managing agreements* N

New Brokers=(Recommendations* N)+(Owner experience in export process* N) Financial resource for collecting plums= N

Recommendations = Fruit Quality* N

Owner experience in export process= International Brokers

Experience producing dried plums= N Lost Brokers= International Brokers*Payment Risk

Dried Plum in Production = (Plum harvest and collection-Plum sales)

External agriculturists= New Agriculturists-Lost Agriculturists

Plum Demand= International Brokers* N

International Brokers= New Brokers-Lost Brokers

AF model

Gap in Production = Desired production-Fruit Production

New Customers= (New Customer Rate*Fruit Customers)+(International Certifications*Customer/certification rate)+(Networking*Customer/networking rate)

Continued on Next Page...

Table C.4 – Continued

Customer/certification rate= N

Customer/networking rate= N

Desired production = WITH LOOKUP (Fruit Customers,([(A, B) ...])

Restriction of Trip budget= N

Exports= $Fruitsales * N$

new contacts = $CEOExperience * N + FruitQuality * N$

Time to adjust production = N

Fruit Demand = $FruitCustomers * N$ Fruit sales = IF THEN ELSE(Fruit Demand-
Fruit Production > 0, Fruit Production, Fruit Production-Fruit Demand)

Fruit Production Activities = (Gap in Production/Time to adjust produc-
tion)+External Advising in Production Processes)

Attendance to Trade Fairs and Roundtables = WITH LOOKUP (CEO Experi-
ence/Restriction of Trip budget,([(A, B) ...])

new managerial activities = Attendance to Trade Fairs and Roundtables

E Business = $CEO Experience * N$

Networking= new contacts* N

Product Customization= $CEO Experience * N$

International Certifications = $Fruit Customers * N$

International Orientation= $CEO Experience * N$

Store Technology = N

Fruit Quality = WITH LOOKUP (Store Technology+External Advising in Produc-
tion Processes,([(A, B) ...])

External Advising in Production Processes = $Fruit Production * N$

Continued on Next Page...

Table C.4 – Continued

New Customer Rate = WITH LOOKUP (E Business+International Orientation+Opportunity Orientation+Product Customization,([(A, B) ...])

Unfulfillment Agreements = WITH LOOKUP (Fruit Customers/Max customers based on service capacity,([(A, B) ...])

International Markets= Fruit Customers *N

Fruit Customers = (New Customers-Lost Customers)

Lost Customers= Fruit Customers*Unfulfillment Agreements

Max customers based on service capacity = N

Opportunity Orientation= CEO Experience*N

CEO Experience= new managerial activities*N

Fruit in Production= Fruit Production Activities-Fruit sales

FT model

Desired fisherman fleet size = WITH LOOKUP (Catch per fisherman*Fishermen,([(A, B) ...])

Catch per fisherman= Effect of fish density on catch per fisherman*N

Fish Tour Catch= Fisherman Catch+Industrial Catch

Fisherman Catch= Catch per fisherman*Fishermen

Gap in plant size= IF THEN ELSE(Desired plant size-Fisheries Plants> 0 , (Fisheries Plants*N) , A) Desired plant size = WITH LOOKUP (Fish Tour Catch,([(A, B) ...])

Industrial Catch= Catch per ship*Industrial Ships

Austral Hake Fish = New Hake-Harvest Activities

Continued on Next Page...

Table C.5 – Continued

Capacity per Fisheries= N

Capacity per Transportation= N

Catch per ship= Effect of fish density on catch per ship* N

Desired industrial fleet size = WITH LOOKUP ((Industrial Ships*Catch per ship),((A, B)...))

Effect of fish density on catch per fisherman = WITH LOOKUP (Hake density,((A, B)...))

Gap in transportation size=IF THEN ELSE(Transportation Capacity-Hake available to be exported> $B, A, (Transportation\ Capacity * N)$)

Exports= Hake available to be sold* N

New Transportation= Gap in transportation size/Time to adjust transportation//

Fisheries Capacity= Capacity per Fisheries*Fisheries Plants Fisheries Plants= New plants

Fishermen= New fishermen

Hake available to be exported= IF THEN ELSE(Fisheries Capacity>Fish Tour Catch, Fish Tour Catch, Fisheries Capacity-Fish Tour Catch)

Time to adjust transportation= N

Transportation Capacity= Capacity per Transportation*Transportation

Industrial Ships=Purchase of ships

New plants= Gap in plant size/Time to adjust plants

Purchase of ships= Gap in industrial fleet size/Time to adjust fleet

Harvest Activities= Fish Tour Catch

Time to adjust fishermen= N

Continued on Next Page...

Table C.5 – Continued

Time to adjust fleet=	N Net regeneration =	WITH LOOKUP (Hake density, ((A, B)...))
New fishermen=	Gap in fisherman fleet size/Time to adjust fishermen	
Transportation=	New Transportation	
Effect of fish density on catch per ship =	WITH LOOKUP (Hake density,((A, B)...))	
Gap in fisherman fleet size=	Desired fisherman fleet size-Fishermen	
Gap in industrial fleet size =	IF THEN ELSE(Desired industrial fleet size-Industrial Ships> A , Industrial Ships* N , Desired industrial fleet size-Industrial Ships)	
Hake available to be sold =	IF THEN ELSE(Transportation Capacity>Hake avail- able to be exported, Hake available to be exported, Hake available to be exported- Transportation Capacity)	
Hake density=	Austral Hake Fish/Max fish overseas	Max fish overseas= N
New Hake=	Net regeneration	
Time to adjust plants =	N	

Appendix D

Table with Loop Distance Ratios (LDRs)

<i>Models</i>	<i>Loops</i>	<i>Id</i>	<i>Lpold</i>	<i>EDR</i>	<i>LDR</i>	<i>MDR</i>
		η (%)	ι (%)	κ (%)	(%)	(%)
		0.33	0.33	0.33		
<i>LR – IW</i>	1 – 8	0	0	0	0	
<i>LR – IW</i>	2 – 9	0	0	83.3	27.5	
<i>LR – IW</i>	4 – 11	15.38	0	98.48	37.58	
<i>LR – IW</i>	6 – 12	0	0	90	29.70	
<i>LR – IW</i>	7 – 13	11.11	0	97.62	35.88	
<i>LR – IW</i>	3	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100	
<i>LR – IW</i>	5	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100	
<i>LR – IW</i>	10	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100	
<i>LR – IW</i>						53.83
<i>LR – CT</i>	1 – 14	0	0	83.3	27.5	

Continued on Next Page...

Table D.1 – Continued

$LR - CT$	3 – 15	18.18	0	100	39
$LR - CT$	6 – 16	0	0	83.3	27.5
$LR - CT$	2	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100
$LR - CT$	4	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100
$LR - CT$	5	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100
$LR - CT$	7	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100
$LR - CT$	17	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100
$LR - CT$					74.25
$LR - AF$	1 – 18	0	0	83.3	27.5
$LR - AF$	3 – 19	18.18	0	100	39
$LR - AF$	4 – 21	11.11	0	95.24	35.10
$LR - AF$	6 – 22	0	0	90	29.70
$LR - AF$	2	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100
$LR - AF$	5	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100
$LR - AF$	7	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100
$LR - AF$	20	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100
$LR - AF$	23	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100
$LR - AF$					70.14
$LR - FT$	3 – 27	11.11	100	100	69.67
$LR - FT$	1	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100
$LR - FT$	2	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100
$LR - FT$	4	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100
$LR - FT$	5	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100

Continued on Next Page...

Table D.1 – Continued

$LR - FT$	6	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100
$LR - FT$	7	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100
$LR - FT$	24	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100
$LR - FT$	25	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100
$LR - FT$	26	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100
$LR - FT$	28	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100
$LR - FT$	29	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100
$LR - FT$	30	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100
$LR - FT$	31	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100
$LR - FT$	32	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100
$LR - FT$					97.97
$IW - AF$	8 – 18	0	0	83.33	27.50
$IW - AF$	10 – 21	0	0	97.67	31.90
$IW - AF$	12 – 22	0	0	90.00	29.70
$IW - AF$	9	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100
$IW - AF$	11	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100
$IW - AF$	13	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100
$IW - AF$	23	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100
$IW - AF$					69.87
$IW - CT$	8 – 14	0	0	83.33	27.50
$IW - CT$	12 – 16	0	0	83.33	27.50
$IW - CT$	9	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100
$IW - CT$	10	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100

Continued on Next Page...

Table D.1 – Continued

$IW - CT$	11	$n.a$	$n.a$	$n.a$	100
$IW - CT$	13	$n.a$	$n.a$	$n.a$	100
$IW - CT$	15	$n.a$	$n.a$	$n.a$	100
$IW - CT$	17	$n.a$	$n.a$	$n.a$	100
$IW - CT$					81.87
$IW - FT$	8	$n.a$	$n.a$	$n.a$	100
$IW - FT$	9	$n.a$	$n.a$	$n.a$	100
$IW - FT$	10	$n.a$	$n.a$	$n.a$	100
$IW - FT$	11	$n.a$	$n.a$	$n.a$	100
$IW - FT$	12	$n.a$	$n.a$	$n.a$	100
$IW - FT$	13	$n.a$	$n.a$	$n.a$	100
$IW - FT$	24	$n.a$	$n.a$	$n.a$	100
$IW - FT$	25	$n.a$	$n.a$	$n.a$	100
$IW - FT$	26	$n.a$	$n.a$	$n.a$	100
$IW - FT$	27	$n.a$	$n.a$	$n.a$	100
$IW - FT$	28	$n.a$	$n.a$	$n.a$	100
$IW - FT$	29	$n.a$	$n.a$	$n.a$	100
$IW - FT$	30	$n.a$	$n.a$	$n.a$	100
$IW - FT$	31	$n.a$	$n.a$	$n.a$	100
$IW - FT$	32	$n.a$	$n.a$	$n.a$	100
$IW - FT$					100
$CT - AF$	14 – 18	0	0	90	29.7
$CT - AF$	15 – 19	0	0	100	33

Continued on Next Page...

Table D.1 – Continued

$CT - AF$	16 – 22	0	0	83.3	27.5
$CT - AF$	17	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100
$CT - AF$	20	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100
$CT - AF$	21	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100
$CT - AF$	23	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100
$CT - AF$					70.02
$CT - FT$	3 – 27	11.11	100	100	69.67
$CT - FT$	14	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100
$CT - FT$	16	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100
$CT - FT$	17	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100
$CT - FT$	24	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100
$CT - FT$	25	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100
$CT - FT$	26	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100
$CT - FT$	28	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100
$CT - FT$	29	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100
$CT - FT$	30	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100
$CT - FT$	31	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100
$CT - FT$	32	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100
$CT - FT$					97.47
$AF - FT$	19 – 27	11.11	100	100	69.67
$AF - FT$	18	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100
$AF - FT$	20	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100
$AF - FT$	21	<i>n.a</i>	<i>n.a</i>	<i>n.a</i>	100

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Table D.1 – Continued

$AF - FT$	22	$n.a$	$n.a$	$n.a$	100
$AF - FT$	23	$n.a$	$n.a$	$n.a$	100
$AF - FT$	24	$n.a$	$n.a$	$n.a$	100
$AF - FT$	25	$n.a$	$n.a$	$n.a$	100
$AF - FT$	26	$n.a$	$n.a$	$n.a$	100
$AF - FT$	28	$n.a$	$n.a$	$n.a$	100
$AF - FT$	29	$n.a$	$n.a$	$n.a$	100
$AF - FT$	30	$n.a$	$n.a$	$n.a$	100
$AF - FT$	31	$n.a$	$n.a$	$n.a$	100
$AF - FT$	32	$n.a$	$n.a$	$n.a$	100
$CT - FT$					97.83

Table D.1: Loop distance ratios (LDRs) between the whole models related to the SME internationalisation in the wine, fruit and fish industries